AUTOMOTIVE and Aviation INDUSTRIES

MAY 15, 1947

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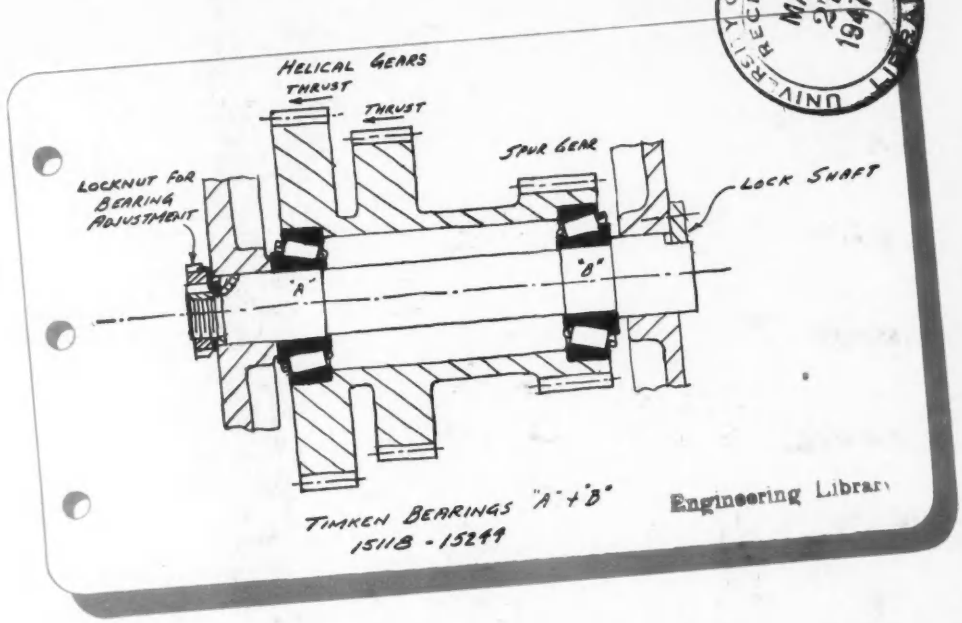
Short story n long life for automatic ransmissions



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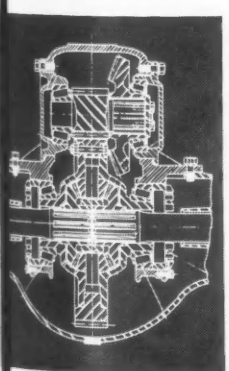
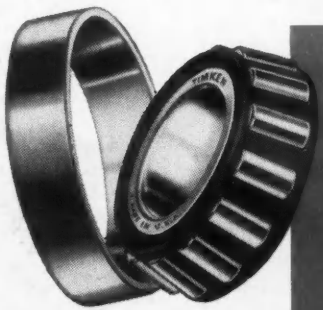


LOOK AT DOUBLE REDUCTION AXLES FOR EXAMPLE . . . Heavy duty applications like this are mastered easily by Timken bearings. In differentials, pinions, transmissions, front and rear wheels — wherever wheels and shafts turn — Timken tapered er bearings have proved their ability to take the tough ds in any combination.

When considering bearings remember that Timken bearings are made of Timken fine alloy steel. And remember too that the Timken Company is the acknowledged leader in advanced design, precision manufacture and rigid quality control.

The Timken Company has been working shoulder to shoulder with the auto industry for almost 50 years. Our engineering facilities are always yours for the asking. If you're designing a transmission—CALL IN TIMKEN* . . . NOW! Just reach for the phone and call Detroit—MAdison 1380. The Timken Roller Bearing Company, Canton 6, O.

NOTE TO P.A.'S: *Because every step of the manufacture of Timken bearings is controlled within our company . . . because our vast manufacturing facilities are widely dispersed . . . you will find the Timken Company a supply source of outstanding reliability.*



TIMKEN

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TAPERED ROLLER BEARINGS

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Can you answer these

7 QUESTIONS

on Automatic Internal Grinding?

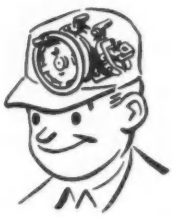
READ THE QUESTIONS CAREFULLY—and see how many you can get without looking.

We'll give you a hint to start with. Automatic grinding goes back quite a few years. It's older than you probably think. But with that, you're on your own.

If you get three out of seven, you've scored a fair average. Get five out of seven and you rate among the experts in machine tools. If you can answer all seven questions correctly, you're either phenomenal—or an old Heald employe.

And if there is any question you'd like to ask about automatic internal grinding—how to put it to work on your own production line, for instance—the chances are we have the answer. Write: THE HEALD MACHINE COMPANY, Worcester 6, Mass.

1. When did the first Heald internal grinder with a completely automatic grinding cycle appear?

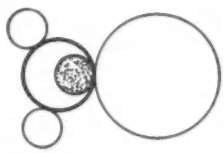


2. What was the first automatic internal that would grind without gage plugs or any connection with the work?

3. Why was the Heald No. 81 Centerless Internal such a revolutionary development in automatic grinding?

4. How many grinding machines can one operator handle—(1) (2 or 3) (4 to 6)?

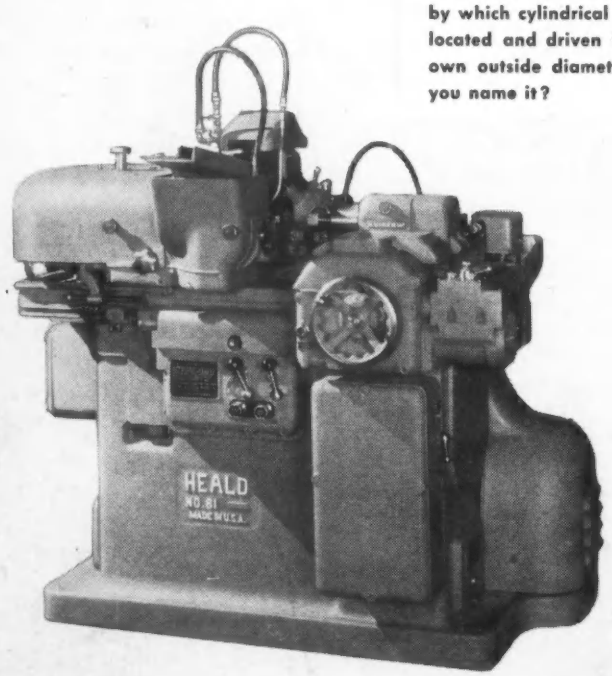
Below, the completely automatic Heald No. 81 Centerless Internal Grinding Machine, for mass production of parts up to 4½" O.D. x 3" long. Automatic sizing is also available on Heald Internals for medium and large-size grinding operations.



5. The diagram shows a method of internal grinding by which cylindrical work is located and driven from its own outside diameter. Can you name it?

6. Can you name the two most accurate methods of automatic sizing in internal grinding?

7. Where would you be most likely to get the newest developments in automatic grinding, along with the service and experience that goes with them?



ANSWERS: **1.** 1925. It was the Heald Electric Indicator Internal. **2.** The Heald No. 72 Size-Matic Internal, introduced in 1926 • **3.** Because it was completely automatic in operation—with automatic loading, automatic size control, automatic cycles, and automatic ejection • **4.** When the machines are Heald No. 81 Centerless models, one operator—and a semi-skilled one at that—can run from 4 to 6 • **5.** Heald Centerless Grinding, in which three rolls replace the conventional chuck • **6.** Heald Size-Matic ("automatic brain") and Heald Gage-Matic (solid plug gaging) size controls. **7.** From Heald, of course—who else?

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● To rebuild Nazi-blasted dikes and remove harmful salt water from subsea level land, the Netherlands Government needed twenty-five powerful little locomotives that could work 24 hours a day, the year 'round. Whitcomb, builder of the locomotives, called on Young Heat Transfer Specialists to produce a radiator, limited in size and weight, yet capable of giving maximum cooling for such continuous operation. Weight of these locomotives was an important factor because they had to operate over narrow gauge track, light rails and uneven, temporary road beds. They had to be powered to haul 47 tons trailing load over grades up to 5%. Meeting such unusual specifications is a part of Young Heat Transfer Engineering . . . combining far-sighted technical research with modern manufacturing techniques. Perhaps Young can assist your organization.

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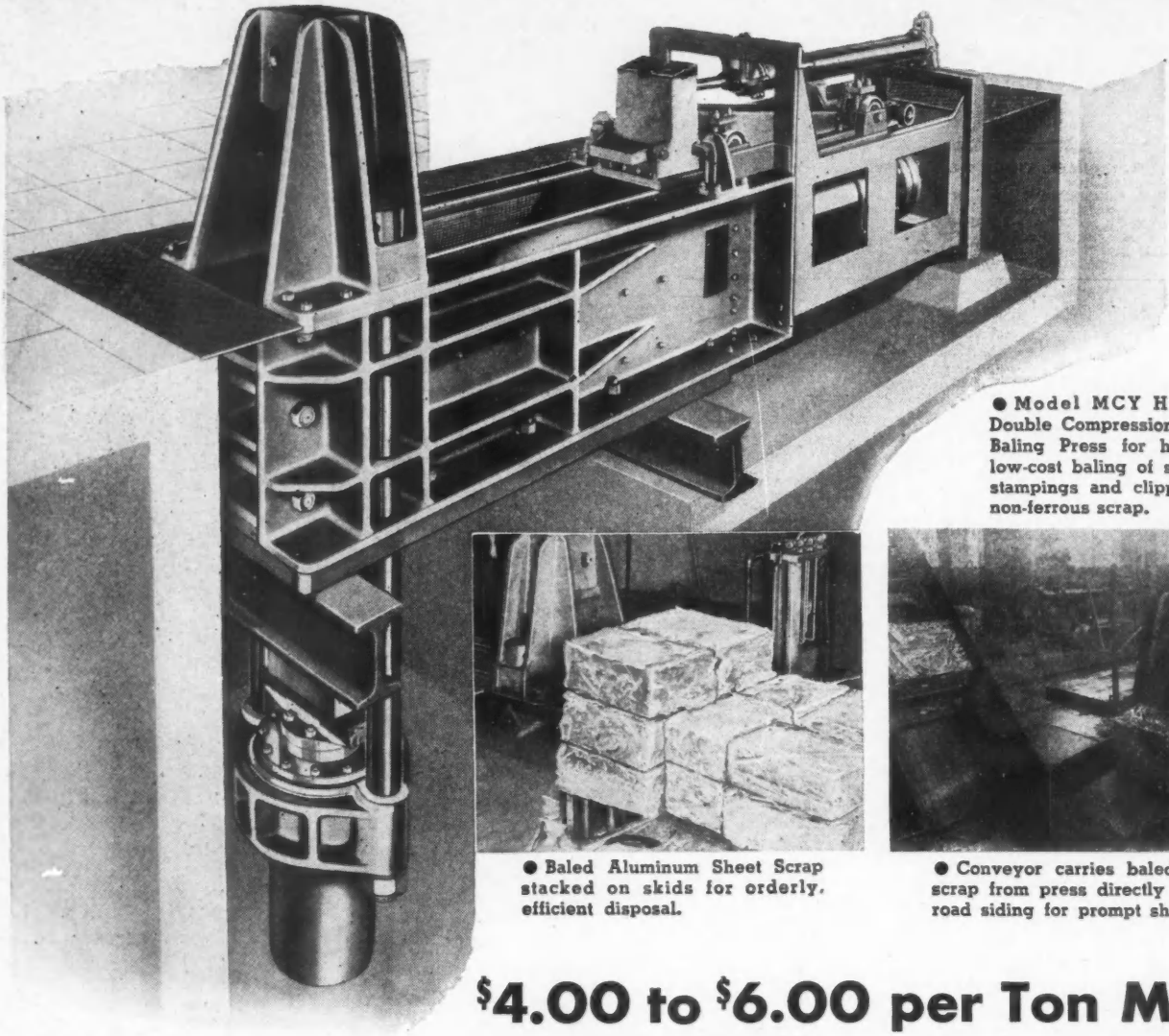

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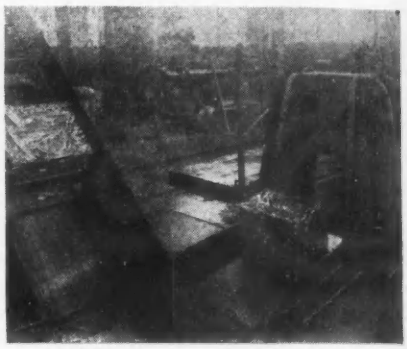

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AUTOMOTIVE and AVIATION INDUSTRIES

Published on the first and 15th of the month

May 15, 1947
Volume 96, No. 10

Some High Spots of this Issue

Dura Hydro-Lectric System

This new equipment for power operation of windows, front seat and top is regular equipment on the 1948 Packard Super-Eight convertible. The system, which is operated from a single power pump mounted on the dash, employs single-acting cylinders at the windows and seat, and a double-acting cylinder to raise and lower the top. It is described and illustrated in an article beginning on page 24.

Unusual Production Methods at Crosley's Plants

The four-cylinder Crosley engine features approximately 120 individual pieces in its cylinder block assembly. This entire unit is made up of steel stampings and tubing, carefully fitted together and joined by copper hydrogen brazing. Joseph Geschlin describes Crosley's production methods, beginning on page 28.

Willys-Overland Brings Out a New Jeep Truck

The Model 2T, a general purpose vehicle with a payload rating of 1500 lb, is the latest addition to the Willys-Overland utility line. Technical details and major specifications of this new vehicle are given in a descriptive article beginning on page 34.

Million-Volt X-Ray Machine That Helps in Solving Casting Problems

A new General Electric X-ray machine, now in use at the Auto Specialties Manufacturing Co., is of great assistance in modifying production processes and increasing casting yield as well as solving specific casting problems. Some of its important applications are described beginning on page 36.

A New British Development in Automatic Transmissions

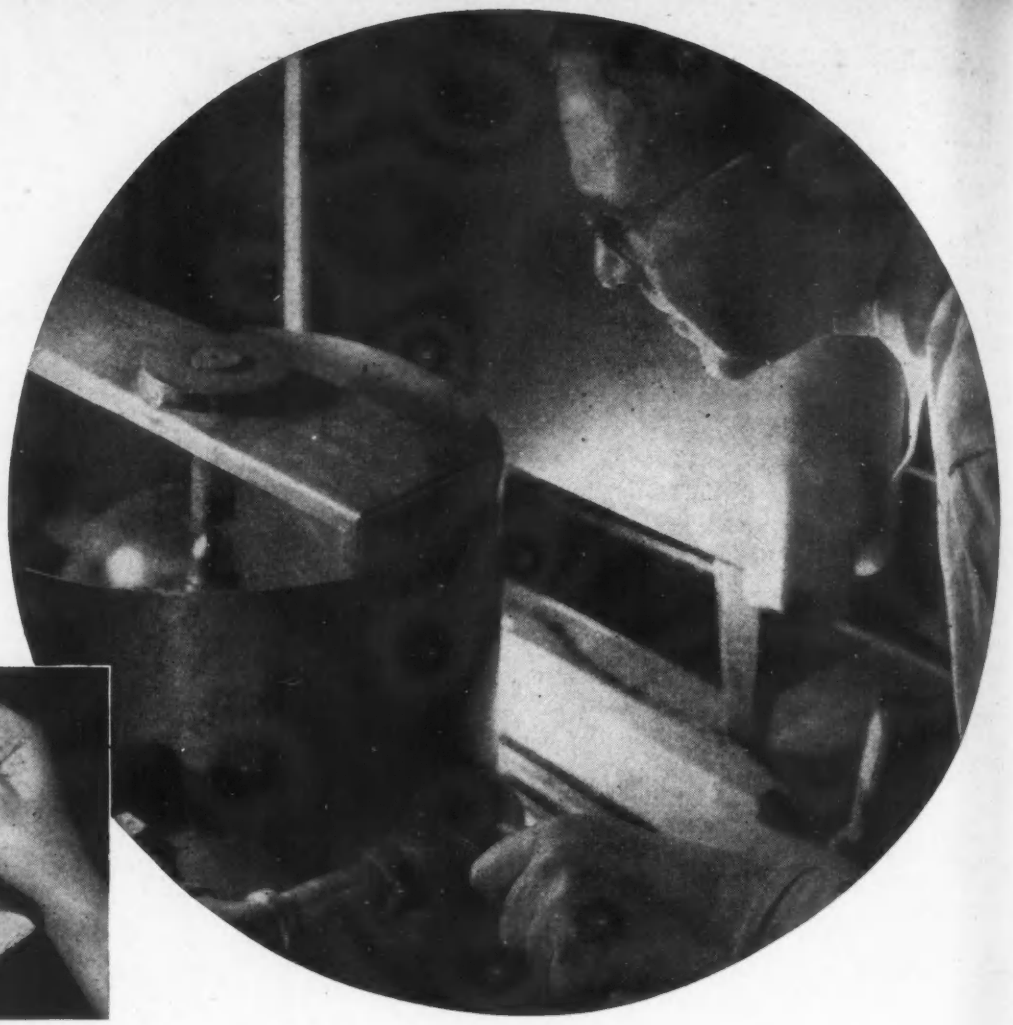
The Kegresse system utilizes an unusual arrangement of hydraulic pistons, controlling valves, and a centrifugal governor to provide rapid and automatic shifting of gears. Its description is supplemented by two excellent sectional drawings. See page 40.

30 Items of New Products and New Production Equipment and Other High Spots Such As:

An Engine Designed for Knock-Free Operation; Producing a Variety of Engines with Single-Purpose Machines; a Rear Torsion Tube Stabilizer as Employed on a British Bus; and an Experimental Laboratory for Paint Testing.

Comprehensive Interpretation of Industry News, Page 17

For Complete Table of Contents See Page 3



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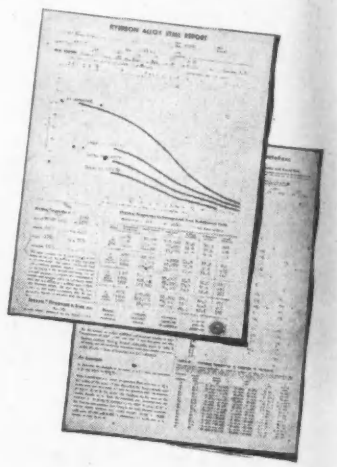

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AUTOMOTIVE and Aviation INDUSTRIES

NEWS of the Industry

Chrysler Proposes 2-for-1 Stock Split

Split of Chrysler Corp. stock, long recommended as being desirable, apparently is near reality. In its report to stockholders for the first quarter of this year, the corporation reported that the dividend on the common stock had been doubled and that the directors have recommended that the stock be split two for one. Net earnings for the first quarter were $21,502,407, highest on record, compared to a net loss of $829,929 for the corresponding period last year. The earnings for the first quarter do not take into account either the price cuts of $25 to $55 on Plymouth cars, effective April 7, nor the effect of the wage increase approximating 15 cents an hour to hourly employes which will boost the corporation's yearly wage cost about $27 million. A stockholders' meeting will be called to consider amending the corporation's charter to allow an increase in the common stock with a view to doubling the number of shares to each stockholder.

Chrysler 2-1 Stock Split . . . General Motors Reports First Quarter . . . Tucker Pilot Models Near Completion . . . Pratt & Whitney Get American Manufacturing Rights for Nene . . . Failure to Float Stock Stops Ferguson Tractor . . . Copper Supply May Increase . . . New Supersonic Wind Tunnel for Army . . . Neptune, New High Flying Navy Rocket . . . Kaiser-Frazer Hits Profit Side After Year of Losses.

GM Non-Automotive Sales Boost 1st Quarter Profits

General Motors Corp.'s sales and profits for the first quarter of 1947 were gratifyingly high with net sales of $804,853,209 and net income of $65,818,019. GM points out, however, that parts and non-automotive products account for a disproportionately large part of the net. Total sales to dealers and export, U. S. and Canada, of cars and trucks in the first quarter of 1947 were 450,-

The Makers of Ford Policy

The members of the Policy Committee of the Ford Motor Co. are photographed here together for the first time. With Henry Ford II, president, at the head of the table, the men who form the Ford empire's policies are (l. to r.), Benson Ford, director; D. S. Harder, vice-president and director of manufacturing; J. R. Davis, vice-president and director of sales; Albert J. Browning, vice-president and director of purchasing; Ernest R. Breech, executive vice-president; Henry Ford II; Mead L. Bricker, vice-president and director of general production division; John S. Bugas, vice-president and director of industrial relations; James W. Irwin, assistant to the president and director of public relations; Harold T. Youngren, vice-president and director of engineering; Lewis D. Crusoe, vice-president and director of finance, and William T. Gossett, vice-president and general counsel. International News photo.

227 as compared with 521,542 in the last quarter of 1946. In the first quarter of 1947 GM employed an average of 375,305 employes with a total payroll of $270,000,000.

Tucker Building Pilots Financing Underway

Tucker Corp. still is sticking to its recent prediction that it will be in production of its radically different automobile in July. Two pilot models are said to be nearing completion and two more are expected to be finished by the end of May. The pilot models will be tested at high speeds to uncover any possible mechanical difficulties. Tucker states that dynamometer tests of the six-cylinder flat opposed engine show a high power rating.

According to a registration statement filed with the Securities and Exchange Commission, Tucker Corp. proposes to sell 4 million shares of $1 par class A common stock. Net proceeds of $17.2 million are expected with a $5 a share selling price to the public and 70 cents for underwriting discounts.

Motor-Vehicle Factory Sales from U. S. Plants*

	March 1947	February 1947	March 1946	Three Months 1947	Three Months 1946	Three Months 1941
Passenger Cars:						
Domestic Market	279,741	244,411	80,239	750,141	187,791	n.a.
Foreign Market	22,069	21,826	5,571	65,036	12,170	n.a.
Total	301,810	266,237	85,810	815,177	199,961	1,226,095
Trucks:						
Domestic Market	92,006	83,253	29,125	252,559	93,882	n.a.
Foreign Market	26,040	23,086	8,541	72,918	23,810	n.a.
Total	118,046	106,339	37,666	325,477	117,692	268,366
Buses:						
Domestic Market	1,272	998	443	3,339	1,109	†
Foreign Market	149	213	84	533	150	†
Total	1,421	1,211	527	3,872	1,259	†
Total—All Vehicles	421,277	373,787	124,003	1,144,526	318,912	1,494,461

†—Included with trucks. n.a.—Not Available.

TRUCK FACTORY SALES—(BY GROSS VEHICLE WEIGHT*)

	5,000 & less	5,001–10,000	10,001–14,000	14,001–16,000	16,001–19,500	19,501–26,000	Over 26,000	Total
January	29,973	12,383	29,156	20,948	3,773	2,807	2,052	101,092
February	30,097	14,777	28,829	24,697	2,863	3,072	2,004	106,339
March	32,621	17,913	29,414	28,449	3,688	3,857	2,104	118,046
3 Months	92,691	45,073	87,399	74,094	10,324	9,736	6,160	325,477

*—Automobile Manufacturers Association.

P. & W. Make Nene, Powerful Rolls-Royce Jet

A British jet engine, the Rolls-Royce Nene, is to be manufactured in the United States by the Pratt & Whitney Div. of the United Aircraft Corp. for fast moving American aircraft. The Taylor Turbine Corp. which holds the American manufacturing rights for the Nene is about to close a transfer agreement including an option to make other Rolls-Royce designed engines. The Nene has a static thrust rating of 5000 lb at sea level.

Licenses to manufacture or import Rolls-Royce airplane engines including the Nene and the Derwent have been granted to Russia, China, and France. Australia is also going to make Rolls-Royce jet propulsion engines.

The Nene was recently used in a De Havilland Vampire airplane which attained an unofficial altitude record of 51,000 ft. The tests were marked by excellent take-off, easy climb, and smoothness of operation through the entire range of power. A Nene ran for 150 hours and passed the Navy type test recently at Philadelphia.

Financing Troubles Halt Ferguson Tractor Plans

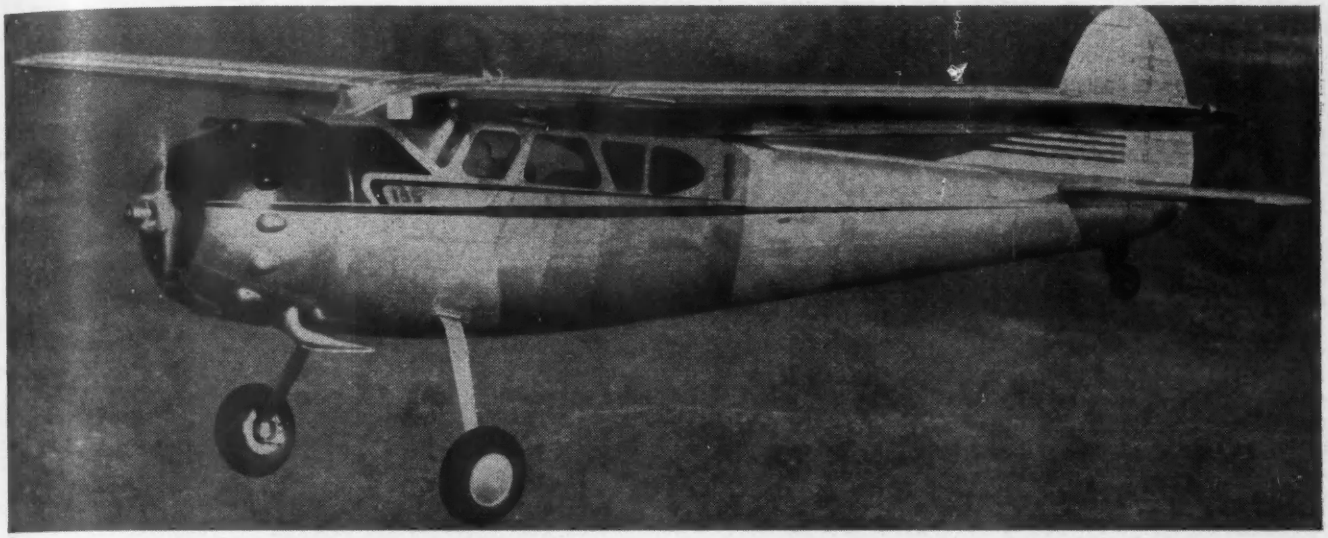
Failure to float an $8 million stock issue has resulted in a decision by Harry Ferguson, Inc., to suspend abruptly its plans to manufacture tractors at Cleveland. The Ferguson organization had planned to manufacture its own tractor following termination of its contract with Ford Motor Co. next June 30. In discharging all employes who were preparing the Cleveland plant for operation, the company stated that current widespread talk of economic recession and of lower prices had been harmful to the company's proposed financing and that the underwriters had advised against going ahead with a public stock issue. A report in Detroit states that Ferguson will not resume its plans for building tractors but will confine its activities to marketing farm implements and to servicing Ford-Ferguson tractors. In view of the Ferguson difficulty in floating a stock issue at this time, there is considerable speculation about what success Tucker Corp. will meet in attempting to float a stock issue to finance the corporation's new automobile.

Aeromobile—For Driving and Flying

Secretly built by two Italians, this combination automobile and airplane was successfully test flown last June. Powered by an 80 hp engine, the all metal Aeromobile reportedly cruises at 190 kmph and has a top speed of 225 kmph. The Savoia Marchetti Co. has taken over the Aeromobile for large scale production; the price tag is expected to be $7000. International News photo.

NEWS of the INDUSTRY

Cessna Presents



Two new models, the 190 and the 195 (illustrated) have been presented by the Cessna Aircraft Co. All-metal, the new Cessnas are identical except for engines: the 195 is powered by a 300 hp Jacobs engine and the 190 by a 240 hp Continental engine. The 195 has a top speed of over 180 mph and a cruising speed of over 165 mph, and the 190 has a top speed of over 170 mph and over 160 mph cruising speed. Spacious enough to accommodate five people, the 195 has a useful load of 1500 lb, and the 190, 1320 lb.

Copper Tariff Suspension May Improve Supply

Suspension of the four-cent-a-pound tariff on copper through legislative action is expected to result in greatly alleviating the copper shortage by early summer, according to spokesmen for the copper industry. It is thought that the two year suspension will greatly increase shipments from American owned mines in Peru, Chile, and Mexico. Production facilities in these countries were widely expanded during the war and the volume of copper imports can be increased greatly in a relatively short time. The national stockpile currently is nearly gone, with an estimated 17,000 tons allocated to American industry in April, leaving only 23,000 tons for distribution during May and subsequent months.

Production of Cars & Trucks*
(U. S. and Canada)

Week ending	1947	Corresponding Week in 1941
Jan. 4	53,437	76,690
11	64,828	115,935
18	75,166	124,025
25	93,278	121,948
Feb. 1	94,114	124,400
8	89,958	127,675
15	97,276	127,510
22	103,400	127,740
Mar. 1	105,175	126,550
8	104,048	125,915
15	105,496	131,410
22	108,472	123,805
29	100,355	124,165
Apr. 5	97,385	116,255
12	97,893	99,260
19	106,337	99,945
26	102,447	108,165
May 3	107,967	130,610
Total	1,706,032	2,132,003

* Compiled by Ward's Automotive Reports.

Army to Build Latest in Supersonic Wind Tunnels

The Army is going to build the newest type of supersonic wind tunnel at the California Institute of Technology, Pasadena—the first of its kind in the United States—to test ram jet and rocket engines in actual operation. The tunnel will cost $2,384,000 and will be located in a building 50 by 150 ft, with a test section consisting of a flexible nozzle with a cross section 15 by 20 in. Air velocity of 3600 mph will be developed by three air compressors, each powered with a 4000 hp motor and capable of producing a total of 171,000 cu ft of air a minute. The tunnel will take about 18 months to complete, it is expected.

New Chevrolet Trucks In July—GMC in June

New Chevrolet truck models, which had been scheduled to appear in June, will be introduced in July. GMC truck, which has been postponing its new models successfully for months, now is scheduled to bring out its new line in June.

New Navy Rocket to Reach 250 Mile Elevation

The Neptune, a new Navy rocket, is expected to carry a useful load more than 200 miles when shot from White Sands, N. M., early this June. The first supersonic long range American rocket, it is expected to have more than twice the range of German V-2 types. Developed by the Naval Research Laboratory and manufactured by Glenn L. Martin Co., each missile will cost between $78,000 and $85,000. Ten have been ordered, costing $1,850,000, to be delivered between 1948 and 1951.

Rocketing 100 lb of scientific instruments more than twice as high as previously, the Neptune is expected to reach a maximum height of 235 miles, and with a 200 lb load to go up 200 miles.

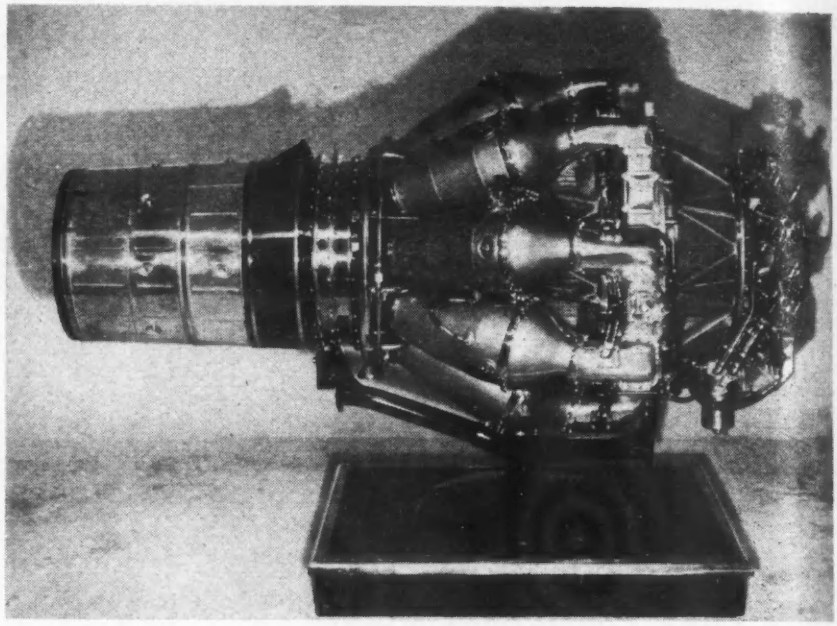
New features are introduced by the Neptune in propulsion and steering, and in the telemetric assembly which broadcasts information to the earth. With a length of 45 ft, 3 in and a diameter of 32 in. the Neptune is characteristically slender. The maximum load is 2000 lb, and with a full load, the missile weighs 11,410 lb, the power plant weighing only 250 lb, and carrying three and a half tons of liquid fuel. It is estimated that with 100 lb of instruments, the Neptune will reach its maximum height in 335 sec.

NEWS of the INDUSTRY

Profits Really Down On Dollar Value Basis

While current reports showing apparently increased profits for the first quarter of 1947 have attracted critical attention among certain groups, closer analysis of important factors not generally recognized make things look different. The first is that in terms of the value of the dollar, first quarter earnings actually were under the similar period in 1940. In that year, first quarter profits of Chrysler, for example, were $15,742,387. However, according to UAW-CIO figures used as a basis for wage increases this year, the dollar had shrunk to 63 cents as of last December and with further inflation since that date today is probably down to about 60 cents. On that basis, discounting this year's quarterly profit by 40 per cent gives a figure of $12,901,484.20 in the case of Chrysler in terms of 1940 dollars. Another factor is that figures show the wage rate of hourly paid employes of Chrysler increased from an average of 98.5 cents in the first quarter of 1940 to $1.325 in 1947. Consequently, whereas the corporation earned 36.5 per cent more, employes hourly rates were up 35 per cent. Moreover, after the recent wage increase, hourly rates are up 45 per cent with a cost to the corporation of an estimated $7 million for the quarter. Employes undoubtedly are currently faring just as well or better than the company percentage-wise

Soon to Be Made in America



The photograph above illustrates one of the Nene jet engines made by Rolls-Royce. The Pratt & Whitney Div. of United Aircraft Corp. will build Nene jets in this country under arrangements with the Taylor Turbine Corp. which has held the American rights.

The Biggest Yet

Built by the Goodyear Aircraft Corp's. Wheel and Brake Div. for the XB-36 Army bomber, this is said to be the largest airplane wheel ever made, standing 51 in. in overall diameter and accommodating a 110-in. tire. Wheel, brake and tire assembly weighs about 4000 lb.

K-F Now Running Three 9-Hour Shifts

Kaiser-Frazer Corp. apparently has hit its stride in production and has started a second assembly line. It also is currently running three 9-hour shifts daily. The assembly line is running one 9-hour shift, and the press shop, upholstery, and other departments are working two and three crews. Present schedule is 9 hours a day, five days a week and 8 hours on Saturday, making a total of 53 hours. Consequently, K-F employes are faring considerably better than workers in most other automobile plants, with time and a half for 13 hours a week. K-F reports a certain amount of absenteeism on Saturdays, but not enough to effect operations.

Packard Head Sees Castings Blocking Peak Production

George T. Christopher, president of Packard Motor Car Co., sees castings as a possible threat to peak automobile production when the supply of sheet steel becomes plentiful. He said that most of the 5000 foundries in the U. S. report they are operating at or near capacity at present and, if that is the case, the foundry industry cannot produce sufficient castings to meet the demand for a 5 to 6 million car year. He expressed the opinion, however, that the nation's foundries with proper planning and equipment can greatly exceed what is now considered peak capacity by cleaning up, redesigning, and mechanizing so that better workmen will be attracted.

Studebaker Reports Profit For First Quarter of 1947

Studebaker Corp. and its subsidiaries earned a net income of $1,655,760 during the first quarter of 1947, equivalent to 70 cents a share on stock outstanding. In the corresponding quarter of 1946 the company showed a net loss of $129,760 after application of tax credits.

NEWS of the INDUSTRY

Black for K-F After Year of Red Ink

Kaiser-Frazer Corp. apparently at last has broken into the black, after operating at a loss every month since it began building cars nearly a year ago. In its annual report to stockholders, K-F reported a consolidated net loss of $19,284,680 for 1946. Edgar F. Kaiser, vice-president and general manager, reported that production during the latter part of April was upward of 400 cars a day and that May and June schedules call for 10,000 and 12,000 cars. The schedule will be increased if Continental Motors meets its engine commitments so that K-F should show a substantial profit in the second quarter. One important factor bearing on the continuing deficit position of the company up to this time is that all charges for engineering, design, and preparation for production have been charged off. While such a course is rather drastic on the profit showing, it leaves K-F in an excellent competitive position to lower prices if and when such action is dictated by drop in demand, since normal amortization charges will not have to be carried.

Bonded Brake Linings Excite Increased Interest

Suppliers who are working with automotive manufacturers on development of bonded brake linings say that this application is receiving serious consideration from all manufacturers. One supplier reports that Chrysler Corp. has informed its dealers that its cars soon will be equipped with bonded linings. Other manufacturers apparently still are not entirely satisfied that bonded linings are absolutely safe under conditions of heat build-up and believe that further development work will be necessary before the system is adopted.

Actually bonded brake linings have already made their appearance in the service field but their adoption on automotive vehicles as original equipment still leaves some problems to be answered. Chrysler with its Cycleweld process probably will be the first to use bonded linings. Other manufacturers report they have not been convinced that all problems are solved. The service angle for one thing is important. There are several methods of bonding replacement shoes but all of them incorporate use of special equipment such as rings and spreaders and curing ovens. There is some discussion about using factory replacement shoes but the cost factor is an important consideration. If the job is done in the field, some means of removing the worn linings must be used involving air chisels, application of heat, or possibly a salt bath at high temperature. One supplier company is reported to have developed a tool that will remove the lining and prepare the shoe for rebonding in about one minute. However, dealer or independent shops are required to make an initial investment of $250 to $400 for equipment. While all manufacturers agree that bonded lining is a coming method of brake lining application, there is considerable division of opinion as to how soon it will be developed to the point where it is safe and economically practical.

James Sees Fuel Economy Through Six Developments

At least six developments now in various stages of progress in the automotive industry offer opportunities for substantial improvement in fuel consumption of automobiles, according to W. S. James, director of research for Ford Motor Co. Widespread adoption of overdrive or four speed transmission, higher compressions, automatic transmissions, weight reduction, supercharging, and lowered wind resistance should lead to improved gasoline economy, he told members of the Natural Gas Association of America at Dallas, Tex., recently. Factors which effect fuel economy and which are not due to car design, he said, are frequency of stop lights, congested traffic, and general use of synthetic tires which decrease mileage five to six per cent.

SAE Handbook for 1947 Has More, Weighs Less

New standards, war-developed data, and revised material from 36 prior editions are all presented in the 1947 SAE Handbook published by the Society of Automotive Engineers. Printed on lighter paper, the new book is a half pound lighter and one-third thinner, and yet presents 10 per cent more text. The new data features the first specifications for hydraulic brake fluids; standards for involute serrated shafts; nomenclature and definitions for three types of crankcase oil; standards for pipe, filler, and lubrication fittings; specifications for automotive steel castings; and general information on welding electrodes and on copper and silver brazing.

Change Ford Front End Suspension in 1948

Latest report on the 1948 Ford front end suspension is that it will have coil springs and direct action shock absorbers. The new type mounting, which will replace the conventional transverse leaf spring, is said to effect some reduction in unsprung weight.

Drive Your Car on the Train

This train-automobile ferry service is the latest Chesapeake & Ohio R.R. bid for railroading convenience. Train passengers on the C. & O. run between Cincinnati and Washington, and other runs, may take their cars along with them. The extra car hooked to the passenger train will hold four standard sedans. International News photo.

NEWS of the INDUSTRY

New Motosacoche Motorcycle

Displayed recently at the Automobile Show at Geneva, Switzerland was this most recent model of the Motosacoche motorcycle. European Picture Service.

Pusher Engine Powers Glider Take-Off

A glider powered by a detachable engine for take-off purposes was described by E. H. Rowley of the Boeing Airplane Co. of Wichita, Kans., before the recent SAE National Personal Aircraft Meeting. Enabling the owner of a glider to operate from regular airports, the detachable engine is based upon the motorboat outboard engine principle. Once the glider has gained attitude, the 22 hp pusher engine is shut off, the propeller folded, and the plane flies on air currents.

Atom Power for Navy

Within five years the U. S. Navy will be atom-powered according to a statement credited to Vice Admiral Earl W. Mills, Chief of the Bureau of Ships. The propelling of warships by atomic energy will not involve major boiler and turbine power plant design change as an atom pile will take the place of oil heat.

Russians Build in Eastern Siberia

The Russians have a new automobile plant now under construction in Kaiskaya Valley, near Irkutsk, East Siberia, U.S.S.R. No information as to the precise type of automobile to be produced has yet been received.

SAE Unlocks Locked Bumper Problem

Bumper standards which eliminate the locking problem have been recommended by the Society of Automotive Engineers and approved by the industry. To be adopted by individual manufacturers, the standards recommend front and rear bumpers which will not go below or rise above 18.25 in. on a normal stop for future automobile, station wagon and light truck models.

GE Test Station for Rocket Research

As part of the General Electric-U. S. Army Ordnance Department's rocket research program, a rocket test station has been built near Schenectady. The station, which will static-test rocket propulsion motors up to 50,000 lb thrust, equal to 500,000 hp, has been in operation over a year. Three steel reinforced concrete pits, each set into the slope of a small hill, comprise the test station which is located some distance from Schenectady and about a mile from any habitation.

Labor

Uncertain That Suppliers Will Hew to 15c Pattern

While the General Motors and Chrysler wage agreements generally have been hailed as assuring labor peace and uninterrupted production for the rest of this year, some automotive parts companies are not as certain. Many parts companies now operating on small margins report they cannot possibly meet the so-called 15 cent pattern without increasing prices. Since the automobile manufacturing companies are exerting heavy pressure on suppliers to hold prices down, lower margin suppliers definitely intend to resist wage demands approximating 15 cents an hour. It still is too early to tell what the outcome will be, but it is known that some parts companies already have negotiated agreements for increases of less than 15 cents, some of them as low as 7 and 8 cents an hour for short term periods, but these lesser agreements were made before the pattern was set. It is not known whether or not the international UAW-CIO will order its locals to accept anything less than the 15 cent pattern but, if that is the case, some serious difficulties and strike threats may result. Wage settlements in the parts industry since the 15 cent pattern was established have varied considerably. Thompson Products has granted a wage boost approximating 16 cents an hour, while Allen Industries, on the other hand, negotiated a firm 10

Shipments of Complete Aircraft and Other Products of Aircraft Plants*

(January and February, 1947)

	January	February	Two Months
Complete Aircraft	2,277	2,013	4,290
For U. S. Military:			
Number of planes	111	99	210
Value of planes and parts	$38,445,248	$42,535,288	$80,980,536
For other than Military:			
Number of planes	2,166	1,914	4,080
Value	$8,591,171	$7,520,573	$16,111,744
Under 3,000 pounds:			
Number	2,146	1,903	4,049
Value	$8,826,181	$6,320,271	$13,146,452
3,000 pounds and over:			
Number	20	11	31
Value	$1,764,990	$1,200,302	$2,965,292
Parts for Other Than Military	$1,030,375	$1,980,699	$3,011,074
Conversions:			
Number of planes	28	27	55
Value	$2,018,780	$2,219,745	$4,238,525
All Other Products, Value	$3,124,847	$1,901,245	$5,026,092
Total Value of Aircraft and Parts	$53,210,421	$56,157,550	$109,367,971

*—Bureau of the Census and Civil Aeronautics Administration.

cent hourly blanket wage increase.

Whether or not suppliers will have to raise prices of their products to automobile manufacturers will depend upon their present profit position and the nature of their production. Those with adequate margins probably could absorb a wage increase up to 15 cents an hour without raising prices. This is especially true in companies making such products as frames, wheels, moldings, and other body stampings in which the proportion of labor to materials is low. On the other hand, manufacturers of such items as transmissions, valves, axles, and other parts in which a high proportion of labor is required will be extremely hard put to absorb further wage increases in most cases. It even is thought likely that one or two of the smaller independent automobile manufacturers may be required to raise prices because of the 15 cent wage pattern. Larger companies, such as the Big Three, apparently have an adequate margin to absorb the increase, so far as their own plant payroll is concerned. However, if parts companies are forced to increase prices, the effect on automobile manufacturing profit margin is certain to cause some concern, at least to smaller producers.

Industry Wage Pattern Hits Small Companies

Regardless of whether the industry-wide pattern finally settles down to 15 cents an hour or a lesser figure, manufacturing costs are going to be increased all down the line. It has been estimated that for the automotive industry as a whole a 15-cent pattern would increase the cost of each car and truck about $45 to $48. A corresponding increase to salaried workers would increase the cost per car a few dollars more. This figure is based on 800,000 employes, 40 man days of work for each vehicle, and a wage increase of $1.20 a day. However, this figure bears some scrutiny since it seems likely now that the general pattern will be a little less than 15 cents considering the possible settlement for less than that figure in the parts industry. It also is a very broad generalization and certainly will not apply equally to all companies. Larger, more efficient ones, such as the Big Three, are equipped so that fewer man hours are required to build a vehicle. Consequently, the result of the pattern among the manufacturers is that the disparity in production costs will be widened. It should be remembered that last year at the time of the 18½-cent increase, prices were marked up all along the line, since the industry was in a state of very low volume production and the profit position would not tolerate any absorption of labor cost increases. This year profits of most manufacturers are such that the labor cost undoubtedly can be absorbed without an increase in price and it is likely that a good part of any increase that may come from higher prices by suppliers also can be absorbed.

Unions Fail in Drive For Security Benefits

As had been predicted, all of the so-called social security demands made by the union on both GM and Chrysler fell by the wayside when negotiations came to a head. The union succeeded in getting a rather meaningless concession that GM would agree to continue discussion on the question of old age retirement and social security insurance. Significantly, the Chrysler agreement stated that all social security demands were to be dropped. The union opened negotiations with Ford early this month although under the contract no wage revision is necessary until the end of May. It is generally believed that the Ford settlement will follow the 15-cent pattern although the union is making a determined fight to get some kind of pension plan incorporated.

Although the unions have not made much progress in the automotive industry on social security and pension programs, there have been a few such concessions made in other industries in recent months. Allegheny Ludlum Steel Corp., in addition to granting a wage increase of 12½ cents an hour, recently agreed to bear the cost of a comprehensive group insurance program covering life insurance, accident coverage, and benefits for sickness, hospitalization, and surgical costs. The hospitalization covers workers' families and also includes maternity care. Although the automobile unions have not made any gains in this direction, labor observers are not ruling out the possibilities for the future.

Eaton Reorganizes Michigan Divisions

Eaton Manufacturing Co. has reorganized its Michigan operations into three new divisions to replace the former Wilcox-Rich Div. Under the new set-up, the Valve Div. will manufacture automotive, aircraft, and diesel engine valves; the Bumper Div. will build rotor pumps for various automotive, truck, tractor, and aircraft uses, and the Saginaw Div. will produce hydraulic valve lifters, tappets, valve seat inserts, and fan

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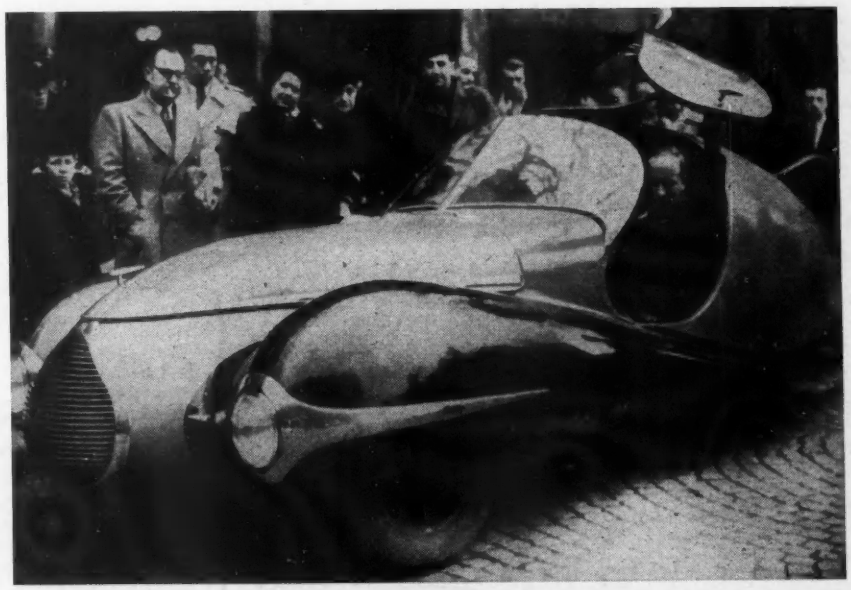
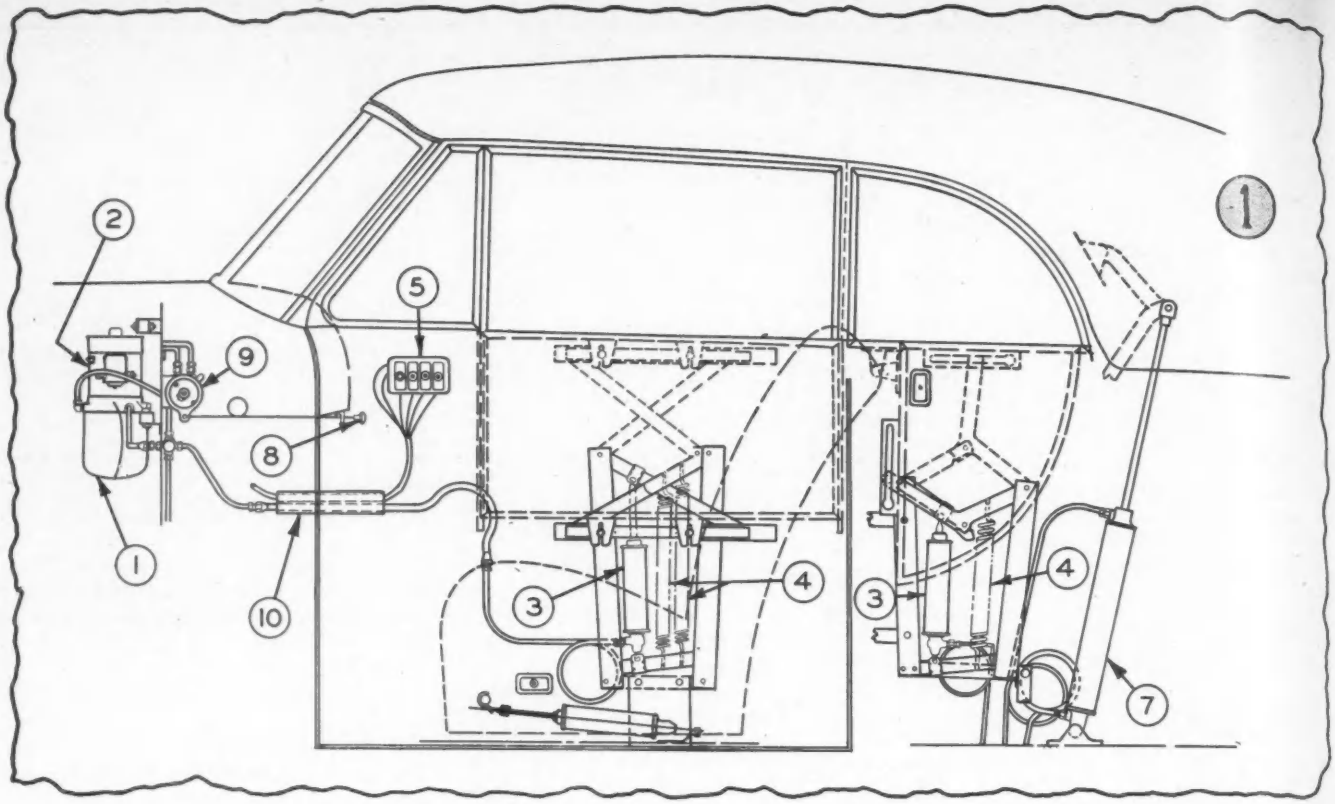
New French Sports Car



The seat of this new low built French sport car resembles the cockpit of an airplane, and the one piece door and roof lifts up when the driver enters. Its 11 hp engine is said to give it a top speed of about 90 mph. International News photo.



Design and Operation of Dura Hydro-Lectric

Equipment for Power Operation of Windows, Front Seat and Top Now Produced in New Department

A RECENT innovation in passenger car regular equipment is the Dura Hydro-Lectric system which provides power operation of door and rear quarter windows, adjusting the front seat and, on a convertible, raising and lowering the top. This new system, manufactured by the Dura Co., Division of Detroit Harvester Co., is installed on the 1948 Packard Super-Eight convertible, which was described in the April 15 and May 1 issues of AUTOMOTIVE AND AVIATION INDUSTRIES.

The Hydro-Lectric system for a convertible, illustrated in Fig. 1, is operated from a single power pump (1) mounted under the dash. This pump consists of a specially designed Gerotor type fluid pump driven by an electric motor (2), the latter being a simple adaptation of a standard passenger car starting motor. Except for the top operating cylinder, this system is of single-acting type. The four windows are raised and lowered by means of switches mounted on each door, while the driver is provided with a master panel of

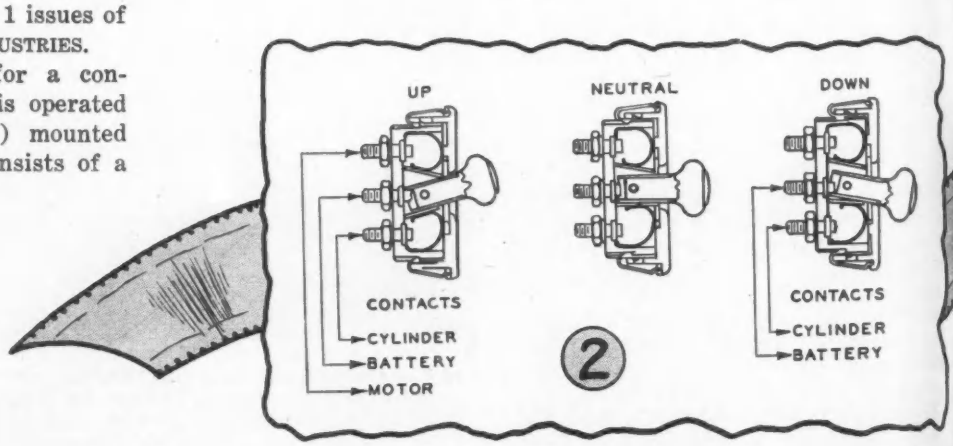


Fig. 2—Three-position switch for controlling automatic operation of windows.

Fig. 1—Diagram showing Hydro-Lectric system on the 1948 Packard Super-Eight Convertible.

four switches (5) to permit him to operate any window remotely. Seat adjustment is effected through cylinder (6), controlled by a switch on the side of the front seat. The group of cylinders for windows and seat adjustment are of single-acting type in which fluid pressure is applied only for raising windows or moving the seat forward, retraction being accomplished by fulcrumed helical springs.

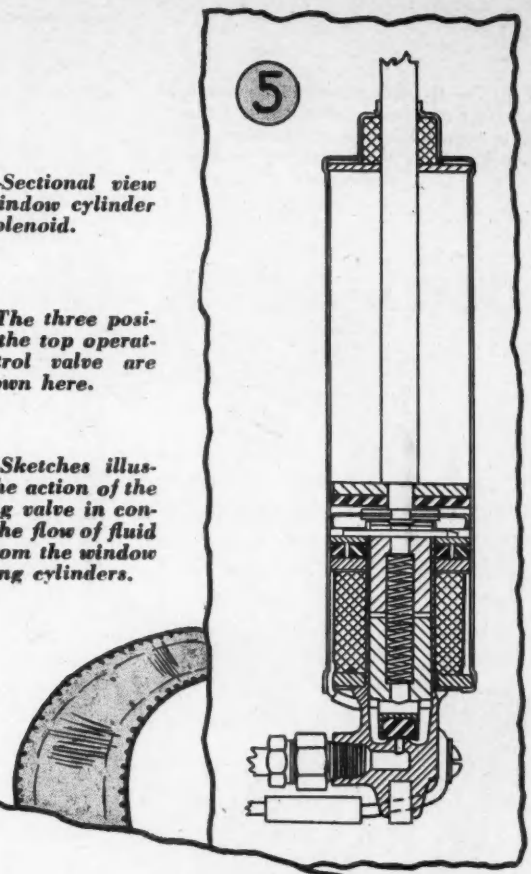
Cylinder (7) for operating the top mechanism is double-acting since the effort required is substantially the same in either direction. Its control is by means of push-pull knob (8) which moves the control valve (9). Cylinder (7) is the only one of the group requiring double fluid piping. Fig. 1 also shows the method of conducting wiring and pressure piping through the door hinge joint. As shown at (10), the flexible portion of the fluid piping and the wiring harness are carried in a double-bore molded rubber member which flexes to follow door movement and provides adequate protection for those lines.

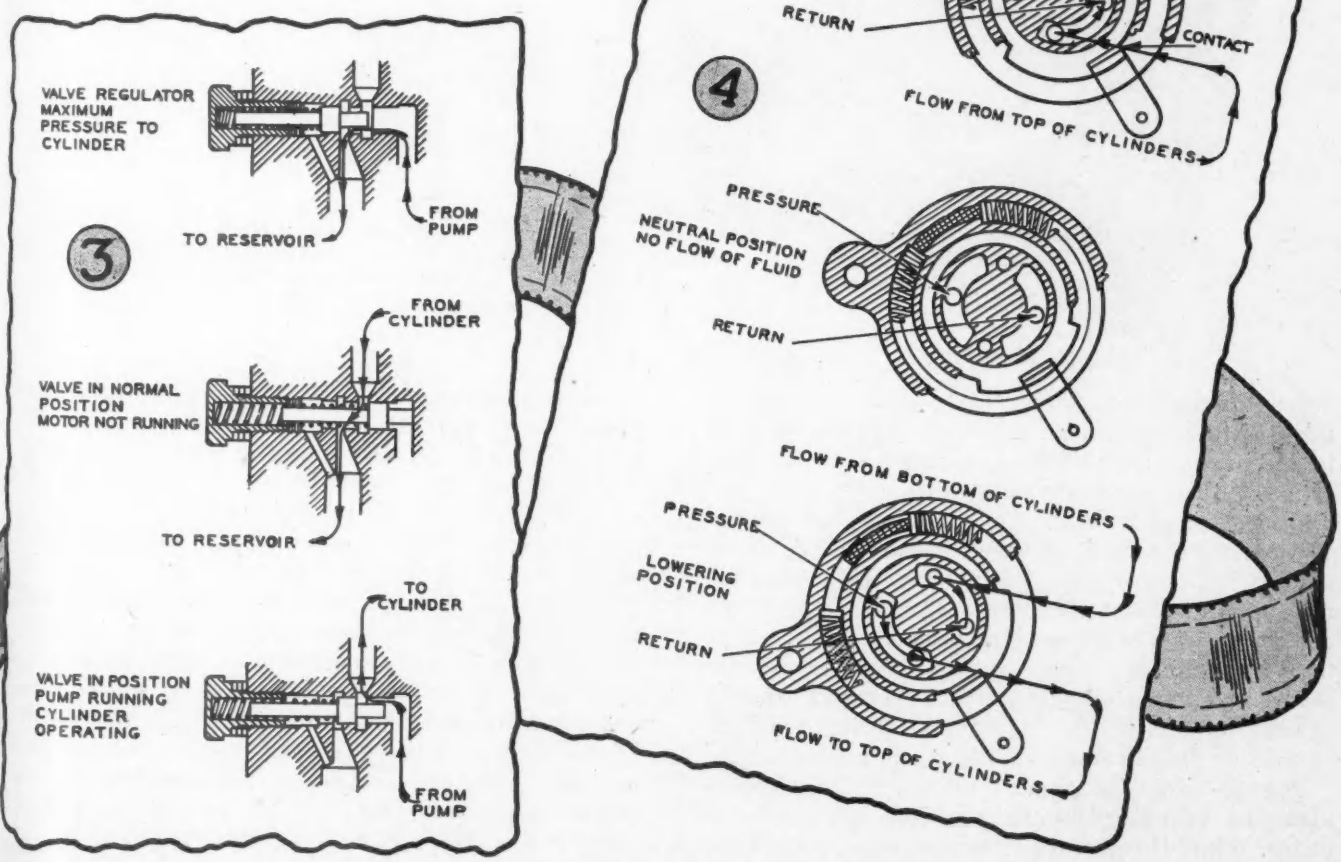
The Hydro-Lectric system relies upon the inter-

Fig. 5—Sectional view of the window cylinder solenoid.

Fig. 4—The three positions of the top operating control valve are shown here.

Fig. 3—Sketches illustrating the action of the regulating valve in controlling the flow of fluid to and from the window actuating cylinders.





System

Fig. 7—In this photo cylinders and springs are being assembled to window regulator frame. Finished units are hung on the overhead monorail conveyor.

Fig. 6—Motor and pump assembly line showing pallet conveyor and testing fixtures. This line has a capacity of 1500 units per day.

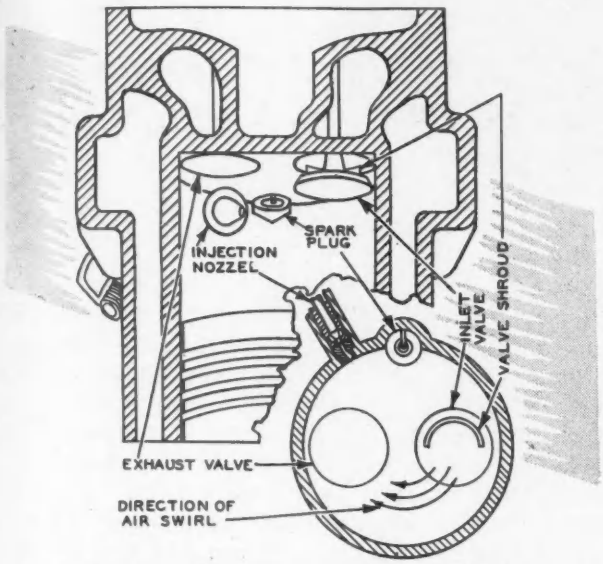
dependent functions of three basic control elements: a three-position switch, an automatic regulating valve in the pump, and a solenoid operated valve in each cylinder. To raise a window, with switch in "up" position, contact is made with the battery, the cylinder solenoid and the motor, as shown in Fig. 2. The motor is in operation only when raising a window. Thus the movement of switch simultaneously starts the motor and energizes the solenoid to permit entry of fluid into the cylinder under pressure. Pump pressure forces the pump regulator valve plunger, Fig. 3, against its seat to the left against spring pressure, permitting fluid to flow from the pump to the cylinder.

For the "down" or return position, the switch energizes the cylinder solenoid, but does not start the motor. Fluid is permitted to escape from the cylinder, and the retractor springs lower the window, forcing the piston downward and returning the fluid to the pump reservoir. In this case the pressure from the cylinder forces the regulator pump valve to the extreme right, permitting the fluid to escape directly to the reservoir. The operation of the seat adjusting mechanism is the same as described above.

The top is operated by a double-acting cylinder, which is controlled by the push-pull knob shown in Fig. 1. This knob is arranged to return to its neutral position at the end of any maneuver by means of a self-centering spring in the control valve which also breaks the electrical connection. To raise the top, the knob is pulled out, uncovering valve parting in the control valve, shown in Fig. 4, to permit the flow of

(*Turn to page* 58, *please*)

New Engine with Knock-Free Combustion



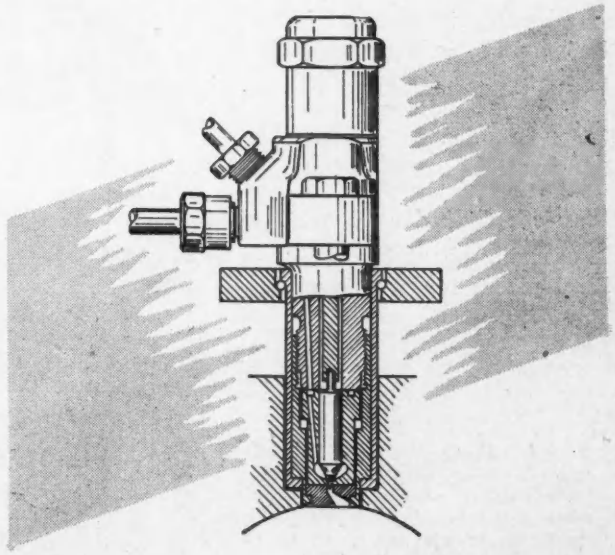
Combustion chamber arrangement of CFR engine used in knock-free investigations, showing the spark, the injector and the valve shroud. A schematic diagram of this arrangement is shown by the inset. Best knock-free performance was obtained with an angular distance of 30 deg. between spark plug and injection nozzle.

A DEVELOPMENT project now underway at the Texas Company's Beacon Research Laboratory is concerned with a new arrangement of the various equipment in an internal combustion engine to produce knock-free operation, independent of fuel quality.

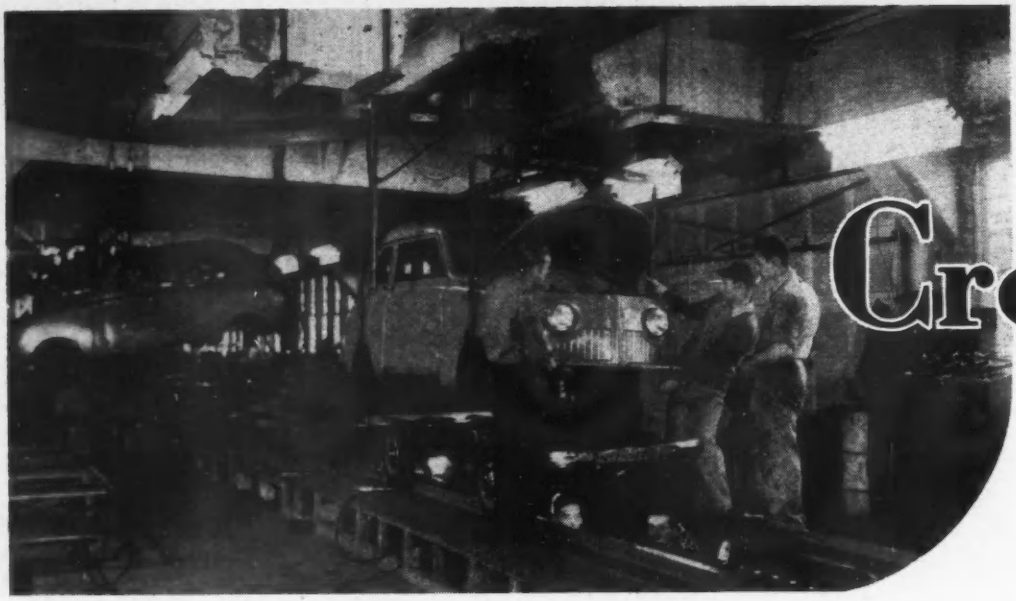
A standard CFR engine, equipped with a modified Diesel fuel-injection system and a shrouded intake valve, was used during the experimental investigations. This arrangement is shown in the drawing. The injector is a Bosch ADN o SD21 pintle-type nozzle with the nozzle outlet covered with a brass deflection adapter (see cross-sectional drawing). This provided a fan-shaped fuel spray directed in the downstream direction of the air swirl produced by the shrouded intake valve. Most satisfactory operation was obtained with injection timing 5 deg ahead of spark timing. The location of the components, combined with the swirling motion of the air and continuous injection of the fuel during the combustion period, resulted in a progressive burning of the fuel mixture. In this way the residence time of combustible mixture at combustion chamber temperatures was made vanishingly small; and combustion knock and pre-ignition were eliminated from engine operation.

This modified CFR engine was operated at practically every condition possible to create on the test stand, and neither knock nor pre-ignition occurred. Compression ratio was varied from 6 to 11, with performance results paralleling that of the Otto-cycle. Almost the entire range of octane number and cetane number fuels, including alcohol, benzene and kerosene, were used with no perceptible change in engine operation except a variation in power corresponding to the change in heating values of the fuels. The knock-free operation of this test engine at 10 to 1 compression ratio and with 20 ASTM octane straight run gasoline just about equaled normal Otto-cycle operation at a compression ratio of 7 to 1 using iso-octane fuel, both engines being run at 1800 rpm. The knock-free test engine was idled at speeds as low as 200-300 rpm, and operated at fuel-air ratios as low as 0.01.

This engine was described before a recent meeting of the Philadelphia section of the SAE, and was also the subject of an article "The Elimination of Combustion Knock" by E. M. Barber, J. B. Malin and J. J. Mikita which was published in the Journal of the Franklin Institute.



Cross-sectional drawing of the injection nozzle and deflection adapter.



Crosleys

By Joseph Geschelin

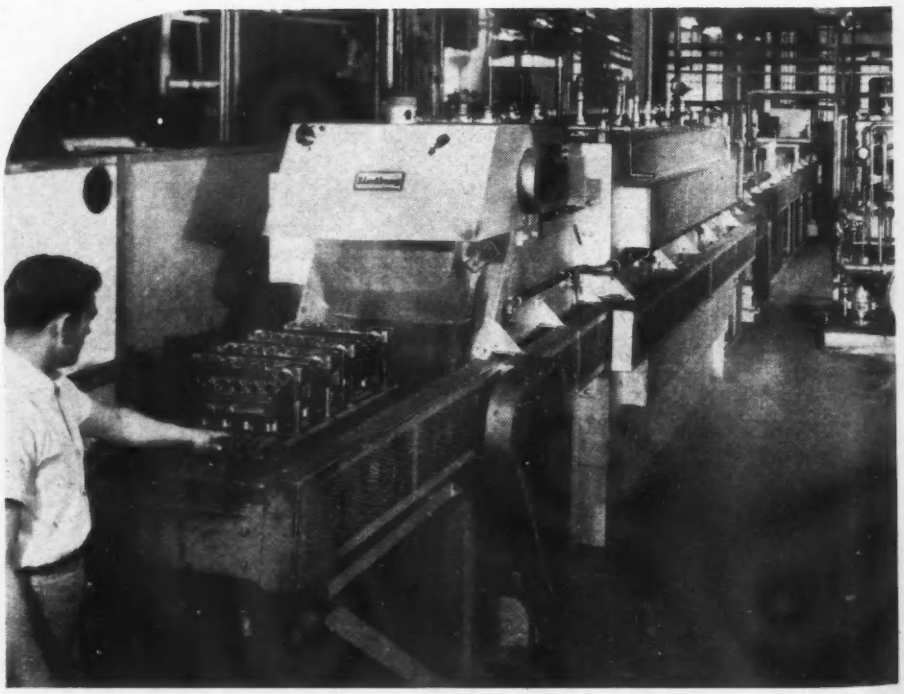
Body drop at Marion. Bodies are transferred to the assembly line by the hoist mounted on the overhead rail.

EASILY one of the most distinctive engines produced in the industry is the four cylinder, valve-in-head powerplant made by Crosley Motors, Inc., Cincinnati, Ohio. With displacement of only 44 cu in. —2.5 in. bore by 2¼ in. stroke—this engine develops 26 hp at 5200 rpm with a compression ratio of 7.5 to 1. What sets it apart from the conventional is that the entire cylinder block structure is an assembly of steel stampings and tubing fitted together with great care and joined into an integral unit by copper hydrogen brazing. At the present writing the Crosley operation is based at two different plants—the engine is built in Cincinnati, while car assembly is centered in Marion, Ind., in a group of buildings formerly the home of the old Indiana truck. This article describes briefly the operations in both plants.

120-Piece Cylinder Block

Featuring about 120 individual pieces for a cylinder block assembly, the majority of the stampings—for cylinder heads, intake and exhaust ports, valve cases, and water jackets—are made of light gage sheet steel. Cylinder barrels are machined from light-walled tubing of SAE 3140 steel while valve seat inserts are of high carbon tungsten vanadium alloy. During the cycle in the Lindberg hydrogen-brazing furnace the temperature range is so controlled as to harden the cylinder walls, valve seats, and cam follower guides. Cylinder barrels harden to about 280 Brinell while valve seat inserts come out around 450 Brinell.

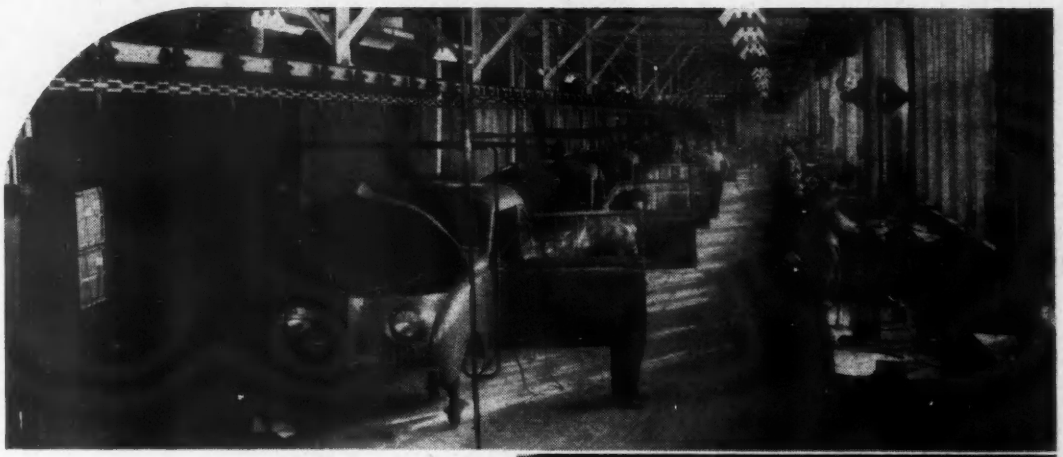
Perhaps the largest stamping is the water jacket. This starts as a one-piece stamping which is trimmed, then bent into box form and tack welded at the edges



The Lindberg hydrogen brazing furnace with controlled temperature range for completing the brazing of the cylinder block assembly. It has three zones—a pre-heat chamber, the brazing chamber, and the cooling chamber.

Latest Tooling and Assembly Methods Now Being Utilized for Mass Producing 1100-Lb. Cars. Sheet Steel, Copper Brazed 26 Hp Engine Is Built at Cincinnati Plant and Car Assembly Centered at Marion, Ind.

on the Production Line



Body trim line at Marion. Note that bodies are suspended from the monorail conveyor. Most of the operators in this department are women.

to hold its shape during assembly and brazing operations.

In addition to solid brazing materials (wires and sheets) it is also necessary to use a brazing paste, applied by brush, at various points to assure adequate sealing.

Consider the exhaust and intake port sub-assemblies. These are stamped in symmetrical halves, then crimped securely. Another of the major sub-assemblies of some complexity is the firing head, so-called. It consists of two valve chambers joined to intake and exhaust port assemblies, after the latter have been fitted with inserts. Next in the process of building up the block is the cylinder sub-assembly which consists of four cylinders, two firing heads, and the heavy base plate.

At each stage of final assembly the individual parts are pressed or staked in place and tack-welded. At the same time operators apply the specified brazing material or paste at each point so that all inaccessible points are thoroughly treated to produce an adequate seal after brazing.

After the block assembly has been completed and fully inspected, it goes to the 60-ft long Lindberg hydrogen brazing furnace for the heating cycle. The furnace has three zones—a preheat chamber where the block is gradually brought up to brazing temperature; the brazing chamber; and the cooling chamber. At a certain stage

Intake and exhaust valve seats are ground in this four-spindle Hall valve grinder, said to be the first of its kind in production.

Here is the small mechanized conveyor line in Cincinnati for the assembly of Crosley pressed steel engines. First station on this line starts with the aluminum crankcase which serves as the foundation for the assembly.

in the cooling chamber where the work has been cooled from 2060 F to around 1500 F, a cool neutral atmosphere is introduced to drop the temperature quickly to 1100 F. The rate of temperature drop is so adjusted as to determine the final hardness of cylinders and valve seats. Upon emerging from the Lindberg furnace the blocks are subjected to a severe leakage test by immersion in a chromic acid bath with air under 20 psi pressure. They are then Bonderized for ten minutes, rinsed with water and dried in an oven.

The next operation produces a hard clear coating of plastic over the entire water jacket area to protect the contacting surfaces from corrosion for the life of the engine. This coating is so durable and resistant that it is said to be impervious to the action of strong caustic or acid solutions. Final process operation is to spray on the prime coat which protects the block while it goes through machining stages.

We are now ready to consider the machining of the block. Some of the major points of interest will be described more in detail below. First operation is the grinding of the bottom of the base plate. This is

Crosley Crankcase Machining

OPERATION AND EQUIPMENT

Mill Bottom—**No. 2 Cincinnati Vertical Mill.**

Mill Top and 2 Sides—**Special 3 Head Mill (Crosley).**

Drill 28 Holes, Ream 12 Holes—**No. 3 Avey Drill Press—2 Spindle.**

Mill Rear End Generator Pad—**No. 2 Cincinnati Horizontal Mill.**

Mill Pads for Water Pump—**No. 1 Hand Mill.**

Drill 2—.368 Holes 13/16 deep, 1—.339 Hole through—**No. 3 Avey Drill.**

Drill 9 Holes through—**No. 24 Cincinnati Drill.**

Drill Oil Channel—**Special Drill.**

Drill 5 Oil Holes for Main Bearings—**Cincinnati Bickford 24 in. Drill.**

Drill Oil Hole for Tower Shaft—**Delta Drill.**

Drill (1) 5/16 Hole and Counterbore .490 for Front of Cylinder Block; also Drill (1) .339 Hole in Top—**Delta and Bench Type on Plate.**

Counterbore ⅛ deep—**No. 2 Avey Drill.**

Drill 7 Holes in Rear End—**Barnesdrill Drill Press.**

Drill 5/16 Hole through, Drill 31/64 Hole 1 21/32 deep, Ream ½" 1 21/32 deep, Spot Face, Ream 1.500 Hole—**Superior Drill.**

Spot Face 10 cored Counterborers for Bearing Studs and Countersink same 10 Holes—**Delta Drill.**

Rough Bore, Ream and Face for Tower Shaft—**Superior Drill.**

Withdraw Bushing and Press in Position—**Arbor Press.**

Spot Face Bottom Tower Shaft Bushing—**No. 2 Avey Drill.**

Ream and Face Bushing for Tower Shaft—**Sipp Drill.**

Rough Bore, Ream & Face for Distributor—**24 in. Cincinnati Bickford Drill.**

Drill Hole & Countersink for Oil Stick—**17 in. Delta Drill.**

Drill No. 7 Hole for Distributor, Spot Face No. 7 Hole for Distributor, Tap ¼-20 Hole for Distributor, Drill 2-7/32 Holes for Dowel Pins for Oil Pump, Ream (2) .2475 Holes—**Delta Tied Drill.**

Drill (1) .257 Relief—**Delta Drill.**

Tap (11) ⅜-16 Holes for Bearing Studs—**Haskins Tapper.**

Tap (4) 5/16-18 No. 2 Holes Inside Opposite Distributor; Tap (2) ⅜-16 Holes Inside Opposite Distributor; also (2) ⅜-16 on Distributor Side; Tap (2) 7/16-114 Holes, ⅝ deep on each side; Tap (1) ⅛-27 Hole Inside case—**Delta Tied Drill.**

Relief Valve-Tap (1) 9/16-18 hole, Tap ⅛-27 Pipe thread in top, Tap (1) ¼-18 Pipe Thread in Rear for Oil Channel, Tap (4) ⅜-16 Holes in Rear End—**Delta Drill.**

Mill for Oil Seal—**U. S. Multi Mill.**

Mill Bearing Locks—**Delta Drill.**

Place caps in position and secure with Washers and Nuts. Use Torque 150-180 lb-in.

Stamp identification numbers on case and caps.

Receive Bearing Caps, Studs, Washers and Nuts; Insert 10 Studs in position. Use Torque 200-250 lb-in.

Rough Bore Main Bearings. Allow .030 for finish—**Boring Lathe.**

Finish Bore Main Bearing—**Ex-Cell-O Precision Boring Machine.**

Assemble Flywheel Housing to Crankcase—**Bench.**

Ream (2) .3735 Holes for Flywheel Housing—**Delta Drill.**

Place 2 Pins in Position.

Face & Chamfer Rear Main Bearing & Bore Oil Seal—**24 in. Cincinnati Bickford Drill.**

Tap (16) 5/16-18 No. 2 Holes, Countersink Distributor Hole—**Haskins Bench Air Drill.**

Wash, Final Inspection.

Crosley Cylinder Block Machining

OPERATION AND EQUIPMENT

Grind Bottom Face—**Pratt & Whitney Surface Grinder.**
Ream 2 Process Holes—**Delta Drill.**
Rough Mill Slot for Camshaft Bearings—**No. 2 Cincinnati Vertical Mill.**
Mill Manifold Side, Rough Valve Cup—**No. 2 Cincinnati Horizontal Mill.**
Rough Bore and Chamfer 4 Valve Cups, Rough Bore and Chamfer 4 Valve Cups & Tower Shaft—**28 in. Cincinnati Bickford Drill.**
Face Valve Seat—**Superior Drill.**
Rough Bore 4 Cylinders, Finish Bore 4 Cylinders—**Ex-Cell-O C-112 Single End—2 Spindle Precision Boring Machine.**
Semi-Finish Valve Guides (Intake), Finish Bore, Finish Face and Rough Seat for Valves; Semi-Finish Valve Guides (Exhaust), Finish Bore, Finish Face and Rough Seat for Valves—**Ex-Cell-O C-112 Single End—4 Spindle Precision Boring Machine.**
Chamfer Cylinder—Bench.
Ream to Size and Face 8 Valve Guide Holes—**Delta Drill.**
Finish Bore 4 Cups for Cam Followers, also Finish Bore and Chamfer Tower Shaft and Face—**Ex-Cell-O C-112 Single End Precision Boring Machine.**
Press in Bushing for Tower Shaft—**Arbor Press.**
Finish Bore 4 Remaining Cups for Cam Followers; also Ream and Face Bushed Hole for Tower Shaft and Chamfer —**Ex-Cell-O C-112 Single End Precision Boring Machine.**
Press in Bushings for Valve Guides—Arbor Press.
Ream Bushings for Valve Guides—**Delta Drill.**
Finish Mill Slot for Camshaft Bearings—**No. 2 Cincinnati Vertical Mill.**
Drill for Dowel, Ream .2485-.248 Hole—**No. 2-2S Allen Drill.**
Grind Intake Valve Seats, Grind Exhaust Valve Seats—**Hall Valve Grinder.**
Check Valve Seats for Concentricity—Bench.
Hone 4 Cylinders—**No. 307 Barnesdrill Honing Machine.**
Retap 23 Holes—**Thor UKS Tapper.**
Wash, Final Inspection.

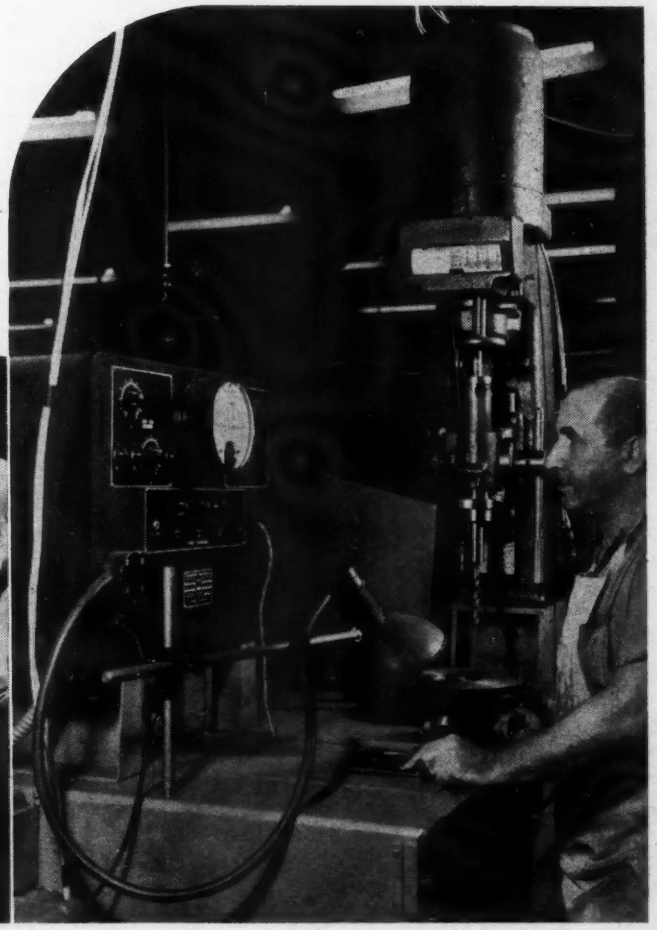
Crosley's on the Production Line

Continued

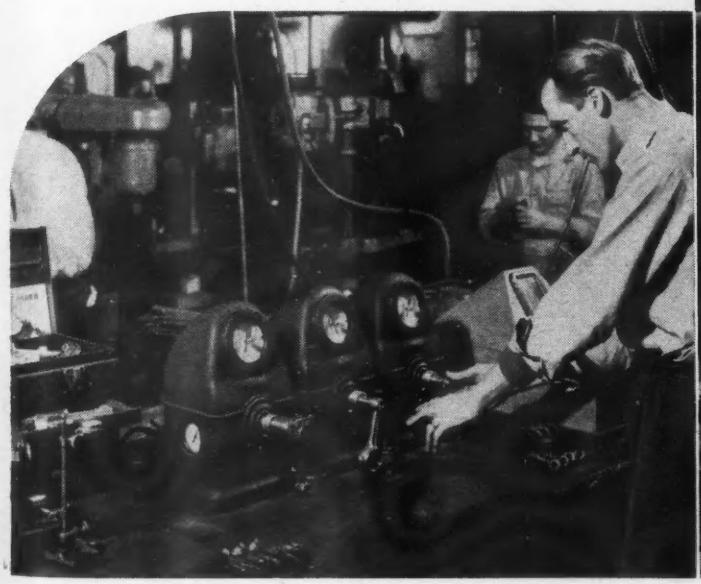
done in a Pratt & Whitney surface grinder with a fixture holding four pieces at a time. This step, in combination with the reaming of two locating holes on the next operation, provides the location in all subsequent fixtures.

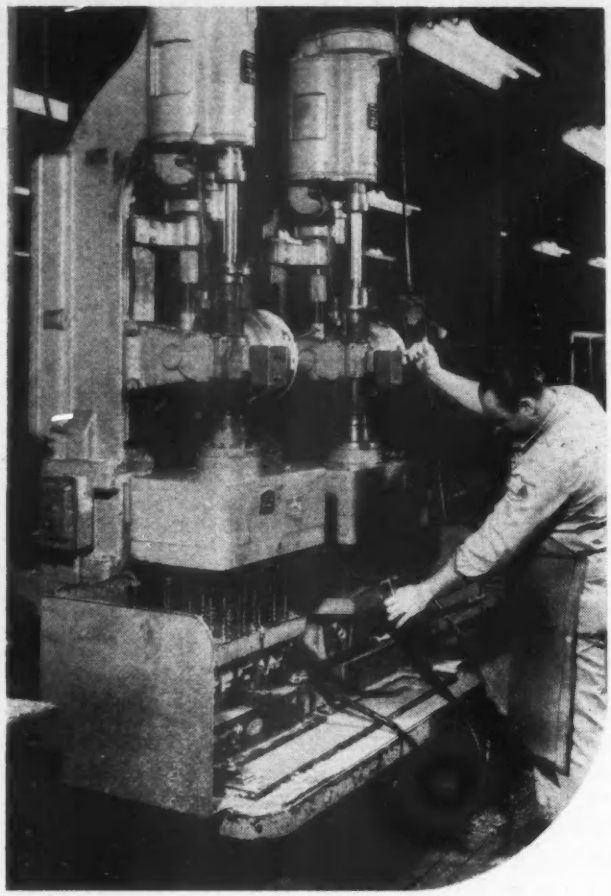
As shown on the routing Cincinnati vertical and horizontal mills are employed for the milling of camshaft bearing slots and manifold sides, and Ex-Cell-O has supplied a number of interesting precision boring

(Right) One of the most modern of the production machines found in the industry is the Gisholt Dynetric balancing machine for dynamically balancing flywheels. The drilling head is mounted directly on the bed of the machine as shown.



(Below) To hold the fine tolerances specified on the small and big end bores of connecting rods, Crosley uses the group of Pratt & Whitney Air-O-Matic gages shown here.





Example of multiple spindle drilling on the crankcase. This is a two-spindle No. 3 Avey drill with mutiple heads for drilling 28 holes in one fixture and reaming 12 holes in the other.

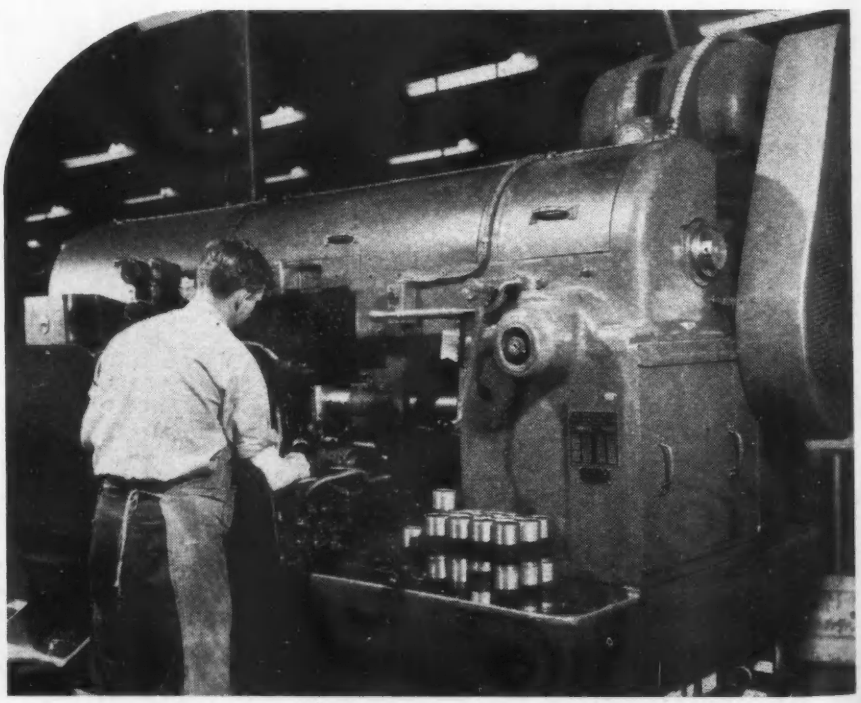
machines for the block line. Largest of these are the two units for rough-and-finish boring of cylinders. Each of these has two boring spindles and is provided with an indexing fixture which shifts the block to a second position for boring the second pair of cylinders. All of the precision boring machines use Carboloy tips of special grade for the fly cutters. The next two Ex-Cell-O machines are of single-end type with four spindles, set up or semi-finish boring of valve guides, and for finish-boring, finish-facing and roughing valve seats—one machine for intake valves, the other for exhaust valves. Later on the rough-faced valve seat is ground to correct form and angle in a four-spindle Hall valve grinder which is said to be the first of its kind to be used in production. Last major operation is to hone the bores in a four-spindle No. 307 Barnesdril honing machine fitted with Micromatic honing tools.

As a matter of interest we have also reproduced the routing for the machining of the crankcase, a relatively small and light permanent mold casting of aluminum alloy. It will be noted that this machine line exhibits considerable improvisation of equipment developed by Crosley, includes a number of Cincinnati milling machines, and a large number of single and multiple Delta drilling units.

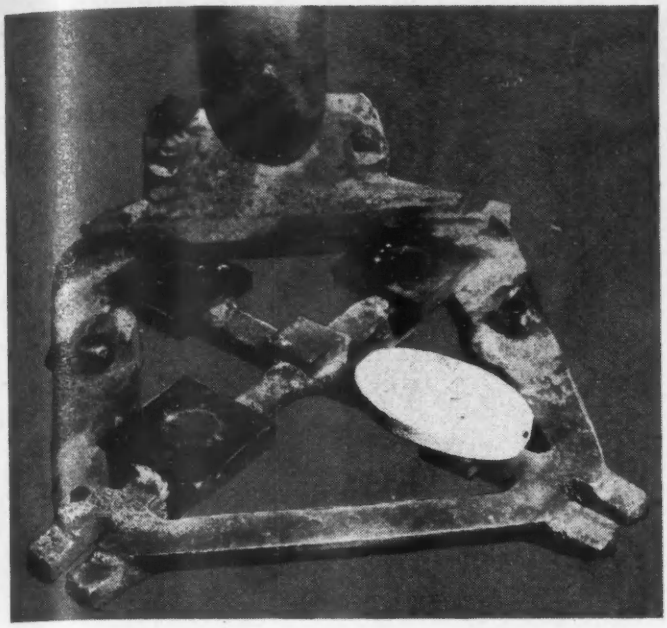
First operation is the milling of the bottom face in a No. 2 Cincinnati vertical mill, followed by the milling of the top and two sides in a special three-head mill designed and built here. Drilling of the long oil channel marks another of the Crosley-built special machines. The machine is composed of a long bed on which are mounted two drilling heads—one at each end. It is of interest to note that these are simple belt-driven drill heads laid horizontally. Finish-boring of the main bearing line in the crankcase features another of the new Ex-Cell-O precision boring machines.

Before leaving the machine shops we should like to comment on several other interesting operations. One of these is the installation of the new Gisholt Dynetric balancing machine for the balancing of flywheels. The drilling head for drilling the balance hole is mounted directly on the bed of the machine as illustrated. Another noteworthy machine is the multiple spindle Natco tooled for the drilling and tapping of main

(*Turn to page 74, please*)



Cylinder barrels are turned and cut to length from alloy steel tubing in this big dual-purpose Conomatic.



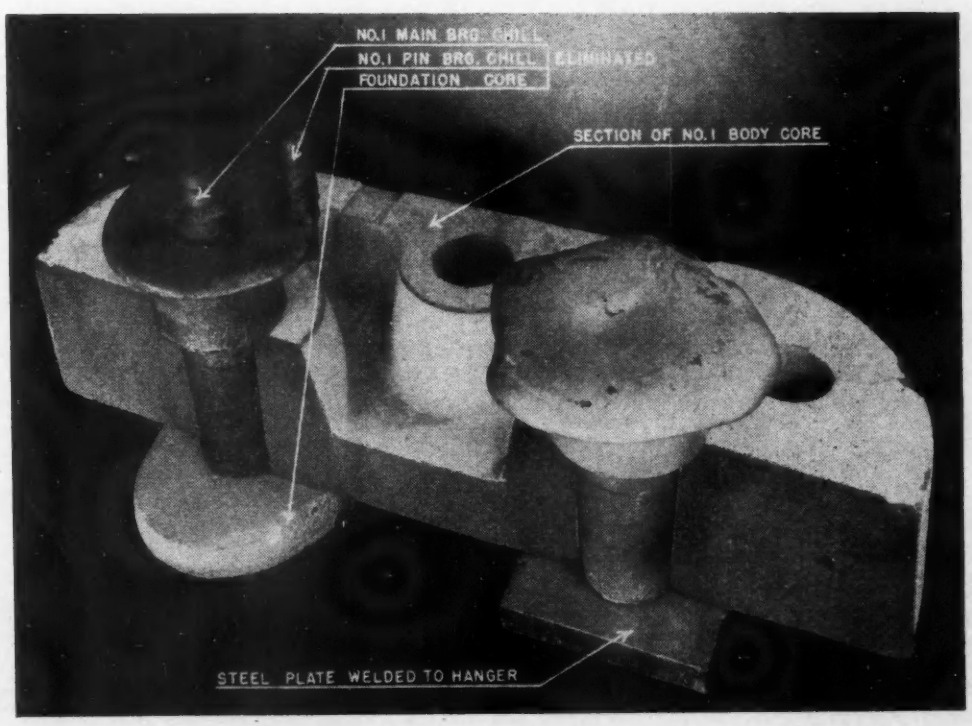
New hanger with three of thermal conductor steel plates visible, the fourth being covered by a core section formerly used

New Molding Technique

Improves Cast Crankshaft

BY A novel revision of crankshaft molding technique, the Ford Rouge plant production foundry claims to have achieved stronger cast crankshafts, reduction in service problems and a considerable saving in manufacturing costs. The new technique utilizes the cooling capacity of the continuous conveyor hangers on which crankshafts are poured in groups of four. The hangers, serving as a base for the vertical molds, promote the progressive cooling of the metal from the bottom up so that molten metal can fill in continually the space normally resulting from solidification and consequent shrinking.

The new method eliminates the costly practice of employing small, cylindrical inserts or "chills" in each crankshaft mold which formerly were suspended near the bottom of the vertical molds to accelerate heat dissipation and to promote progressive solidification from the bottom. The inserts became an integral part of the crankshaft; and since fusing was not always complete, and since moisture or foreign material often adhered to the metal, gas pockets, porosity and consequent structural weakness sometimes resulted. The new technique also has reduced drill breakage by approximately 75 per cent, Ford states, since the high breakage formerly encountered was due to the necessity for penetrating the softer "chill" insert when drilling oil holes through the number one crankshaft and crankpin bearings.



Lower section of mold and castings showing essential differences between former and current crankshaft molding techniques at Ford Rouge foundry

Major Specifications of Model 2T Truck

Wheelbase	118 in.
No. of Cylinders	4
Bore and Stroke	3.125 in. by 4.375 in.
Piston Displacement	134.2 cu. in.
Compression Ratio	6.48 to 1 (opt. 7 to 1 for alt)
SAE Rating	15.63 hp
Max. B HP	60 at 4000 rpm
Max. Torque	106 at 2000 rpm
Rear Axle Ratio—Standard	5.38 to 1
Optional	6.17 to 1
Tread—Front	57 in.
Rear	63.5 in.
Back of cab to C/L of rear axle	39.84 in.
Back of cab to end of frame	74 in.
Dash to C/L of rear axle	79.5 in.
Overall length of Chassis (With Bumpers)	182.13 in.
Overall length of Chassis (Less Bumpers)	177.63 in.
Overall width at front fenders	66.5 in.
Overall width at rear fends	73 in.
Max. width between rear tires	75 in.
Frame width—rear	47 in.
Frame overhang—rear	34.88 in.
Max. body length back of dash	103.66 in.

Willys-Overland Introduces

LATEST addition to the Willys-Overland utility line is the Jeep model 2T truck, preliminary announcement of which was made in the Oct. 15, 1946, issue of AUTOMOTIVE AND AVIATION INDUSTRIES. This is a general purpose vehicle of 4700 GVW with a 118 in. wheelbase and powered by a four-cylinder L-head engine of 60 hp. Additional technical details of this new truck are presented herewith.

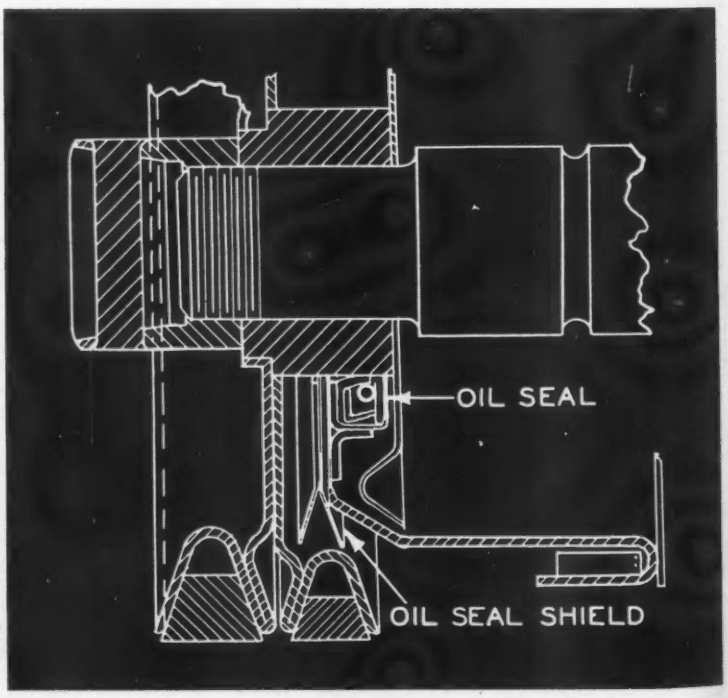
The model 2T, which has a payload rating of 1500 lb, will be available as a chassis with or without both cab and body, or as a chassis with cab alone. Types of bodies include: pick-up box, pick-up and metal enclosure, platform, and platform with stake rack. Weight of the stake rack truck is 3200 lb.

The chassis frame is of truck design and consists of one-piece pressed steel channels with kick-ups over front and rear axles, and six cross members of flanged U and channel section. An important feature in body design is the interchangeability of such parts as front end sheet metal, doors, and fenders with similar units of the Jeep station wagon, model 4-63. This Jeep station wagon was described in the Aug. 1 and Oct. 1, 1946 issues of AUTOMOTIVE AND AVIATION INDUSTRIES.

The new model 2T truck has a conventional, reverse Elliot type Clark Equipment front axle of I-beam section. Front springs are semi-elliptic, 36.25 in. eye to eye, 1.75 in. wide, with a rate of 225 lb per in. The rear axle is of Timken semi-floating heavy-duty type with spiral bevel gears and underslung spring centers. Standard ratio is 5.38 to 1; optional ratio of 6.17 to 1 is available. Rear springs are of semi-elliptic two-stage type, 50 in. eye to eye, two in. wide with a rate of 500 lb per in. Both front and rear springs have the leaves shot blasted on the tension side to increase endurance limit.

Gabriel direct-acting hydraulic two-way shock absorbers with one-in. cylinders are used both front and rear, attached to the frame side rail with a connecting link to the spring pad. The propeller shaft is of tubular type with Spicer needle bearing universal joints. Four-wheel hydraulic brakes are standard, with a brake drum diam of 11 in., both front and rear. Lining length per wheel is 22.0625 in. Total braking area is 176.50 sq in. Master cylinders are one in. in diam while wheel cylinders are 0.875 in. rear and 1.125 in. front.

The four-cylinder L-head engine has a 3.125 in. bore, 4.375 in. stroke, 134.2 cu in. displacement, and develops its rated 60 hp at 4000 rpm. Maximum torque is 106



Sectional drawing of front end of crankshaft of model 2T Jeep truck engine, showing oil seal, oil shield and fan pulley web arrangement which permits the escape of water and dirt

Model 2T stake truck. Loading space is 76.5 in. long by 67.75 in. wide, with gates 30.56 in. high. Overall size of platform without racks is 81.5 in. long by 73 in. wide

New Jeep Truck

lb ft at 2000 rpm; and standard compression ratio is 6.48 to 1, with an optional ratio of 7 to 1 for high altitude operations. This engine is interchangeable with that of the 4-63 station wagon engine. Crankshafts are drop-forged, heat treated and counterweighted. Pistons are of cast aluminum alloy, tin or brass plated, with two compression and one oil ring above the wrist pin.

A unique design feature is found in the sealing of the engine front main bearing. As illustrated, the fan pulley is fitted with a special slinger whose function is to throw off water and dirt at this point. The fan pulley web is drilled to permit these materials to escape to the outside. In addition, the outer end of the shaft is protected by installation of a Chicago Rawhide seal to prevent entry of dirt and water.

Crankcase ventilation is provided by a sealed system actuated by an AC valve in the intake manifold connected by a tube to the valve spring cover. Air for the crankcase is filtered through the air cleaner.

The fuel system has a Carter, Model WO-631-S, 1.1875 in. downdraft carburetor with positive action accelerator pump and single idle adjustment. An oil bath air cleaner of Oakes or Donaldson type is standard. To assure continuous windshield wiper action, an AC combination fuel and vacuum pump is used.

The Auto-Lite electrical system comprises a ventilated 6 v, 35 amp capacity shunt-wound generator with three-unit voltage and current regulation. The starting motor is pedal operated and has a manual engaging type over-running clutch pinion. With this arrangement the starting pinion is constantly engaged and remains engaged until the driver is sure the engine has started. Spark plugs are Auto-Lite Type AN-7 and of 14 mm size.

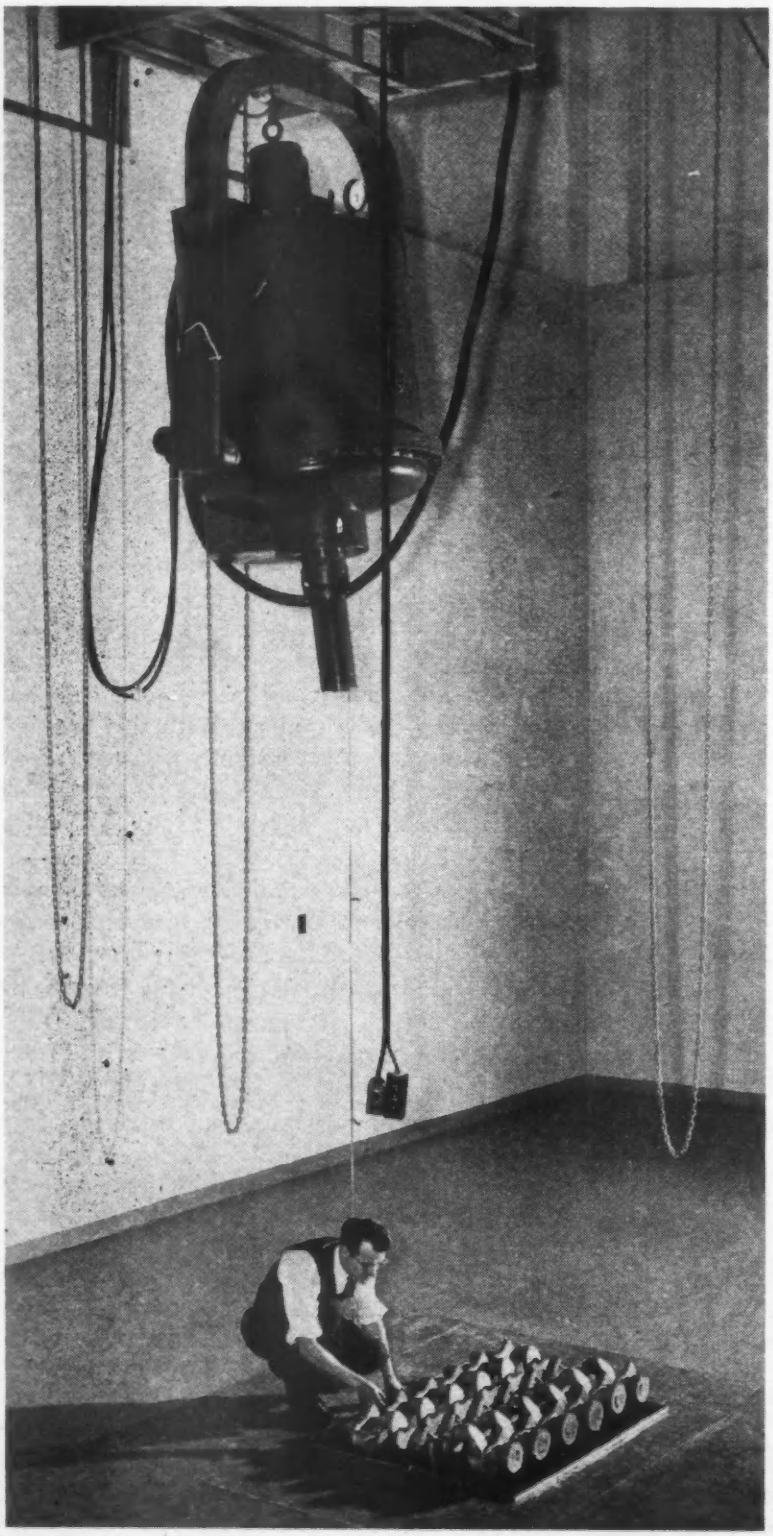
The Warner Gear transmission with three speeds forward and one in reverse with synchromesh for second and third is standard.

One unique point is the provision for lubricating the main shaft quill bearing, which consists of a scoop over the bearing to pick up lubricant and force it over the bearing needles.

Steering gear is of Ross cam and twin lever type with a variable ratio (15.4—13.5—15.4 to 1) and is mounted to the frame. Fuel tank is of 15 gal capacity and fitted with a Ventalarm. Radiator core is of ribbed tubular type, two in. thick and provided with a 1.375 in. shroud ring. A large diameter pressure cap is fitted as standard equipment, holding a pressure of 3.25 to 4.25 psi. Cooling system capacity is 11 qt. Sealed beam head lamps are standard and mounted in the front face of the radiator grille. Battery is of 6 v type, 15 plates, 100 amp hr capacity, with wood separators, and double baffle cap with rubber gasket and star level indicator. Wheels are of drop center type with 7.00—16-6 balloon tires and 16x5.00 E rims.

Million-Volt *Solves*

By E. H. Grimm
Metals Roentgenologist,
Auto Specialties Manufacturing Co.



A NEW General Electric million-volt X-ray machine, now in use at the Auto Specialties Manufacturing Co., plays a vital role in solving specific casting problems, modifying production processes and increasing casting yield. Auto Specialties, which produces castings and other products for the automotive industry, has installed the huge X-ray machine in a special concrete building and now does practically all its radiography of both large and small objects with this unit.

Contrary to commonly-held opinion, experience shows that a company does not have to be a producer of heavy castings to use high-voltage X-ray economically. The exposure time economies of higher-voltage are equally available to the producer of small castings, such as motor housings and automotive crankshafts. Also, because of its higher intensity, the more powerful X-ray equipment can be backed further away from the film, thus permitting the radiography of more products with one exposure. Radiography of crankshafts, for example, is done at a target-to-film distance of 10 ft, which permits X-raying six or more crankshafts at one time. These occupy such a large area that more than four films must be overlapped to include all the shafts. Also, because of its shorter wavelength, high-voltage X-ray can encompass a greater range of thicknesses in a single radiograph, thus making it ideal for such irregular shapes as crankshafts and jacks, regardless of size.

A classic case of re-designing the product to suit the process is found in a jack base manufactured by Auto Spe-

This General Electric million-volt X-ray machine is used at Auto Specialties Manufacturing Co. in radiographic analysis of both large and small castings. E. H. Grimm, chief metallurgist and roentgenologist, is preparing to X-ray six crankshafts at one time, overlapping four 14 by 17 in. films beneath them.

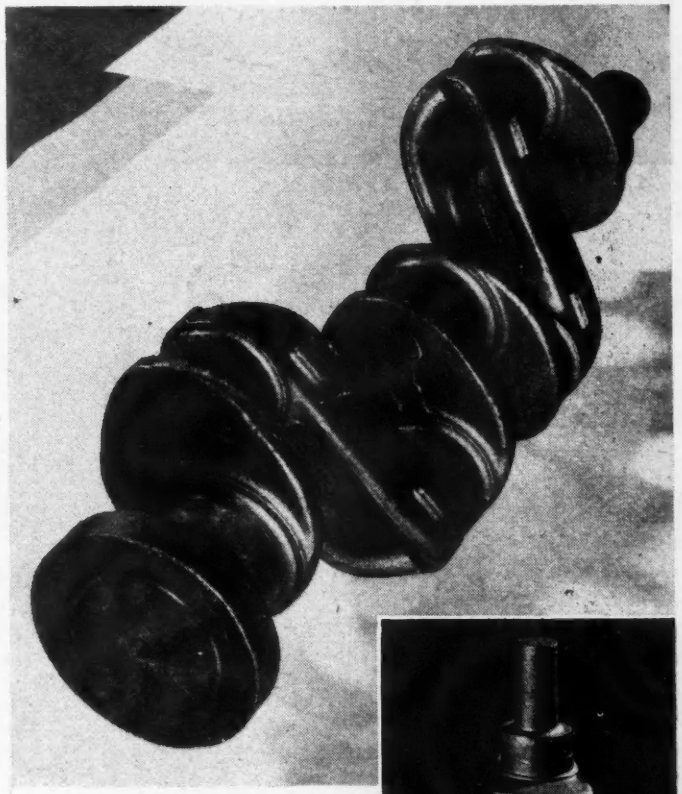
X-Ray

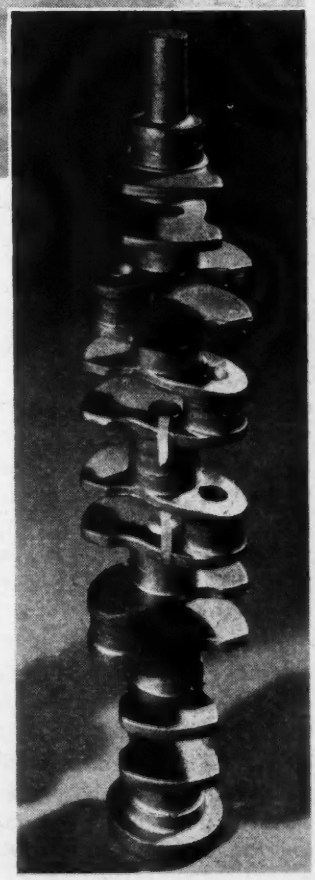
Crankshaft and Other Casting Problems

cialties. As shown by the accompanying illustrations, porosity persistently occurred in a spot near the gate; and no amount of gate-shifting seemed to help. Finally, it was proven that this problem was not due to gating at all, but to the difficulty experienced by the metal inside the mold in flowing through a narrow section. By creating a small channel or web connecting two protruding sections of the casting, this trouble was eliminated entirely. An effort was then made to weld those bases of the old design in order to eliminate the porosity. The radiographs showed, however, that welding was not quite good enough to salvage these items. They were scrapped.

The case of a sprue-and-runner change in casting a motor housing is another example of product re-design. As a result of radiographic study, it was found that this sprue and runner could be shortened, effecting a reduction of 5½ lb and thus increasing the yield of actual casting from 55 to 59 per cent of the melt. Prior to the redesign, the weight of the metal in the mold was 90 lb, of which 40 lb or 45 per cent was sprue-and-runner. Afterward, total weight was cut to 84½ lb, of which sprue-and-runner accounted for 34½ lb.

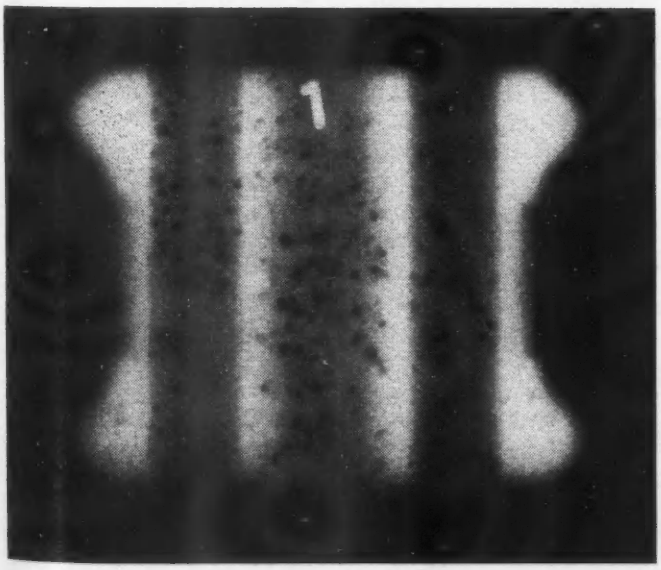
Another leading example was the shifting of



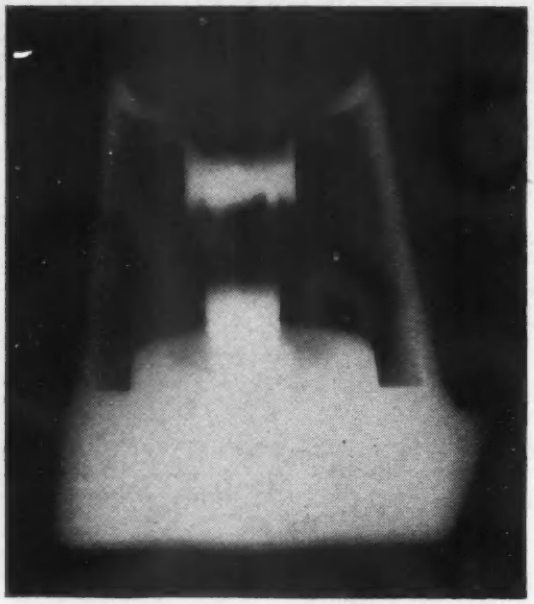


(Above) Hollowing-out of bearing areas on this crankshaft resulted in great saving in weight.

(Right) Radiographically controlled casting procedures permitted development of this design with partial hollows in the bearings and complete hollows through the center shaft.

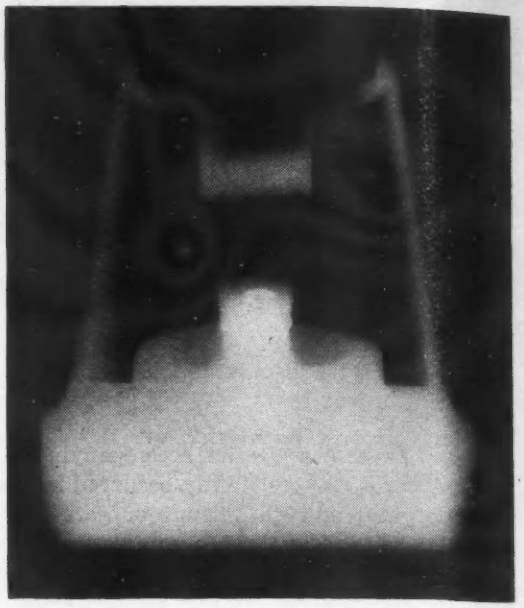


(Left) X-ray picture shows pinholes in casting caused by insufficient de-oxidation of the melt.



(Left) This X-ray photo of the jack base shows shrinkage in web below gate caused by restriction in flow between two protruding parts.

(Right) Radiograph of re-designed jack base shows no shrinkage (web area enlarged). Rejections in the casting of this product were cut from 25 per cent to zero.



In this photo of jack base, arrow shows web which had to be increased in size to permit vertical flow and eliminate shrinkage.

a gate on a crankshaft from the bearing to the arm, which eliminated the porosity that had been the principal source of difficulty in getting into production on this particular product.

Radiography has made it possible to execute radical changes in crankshaft design, such as the casting of crankshafts with hollows partially or completely through the center shaft and bearing area. Only by the closest control and observation of results has it been possible to develop proper molds and pouring techniques for this purpose. In one case, because of these reductions in metal content, an unfinished cast crankshaft weighed one lb less than did a finished shaft, produced by another process which did not permit incorporation of the hollows.

The use of X-ray has enabled foundrymen to invade many fields and attempt many changes in product design that they would not have dared to attempt without it. While designers may be able to predict in advance that the new shape will withstand all the necessary strain, one of the most difficult things to determine is how the new shape can be successfully cast without a prohibitive proportion of excess metal to feed it, and without developing hot tears, shrink, porosity and blows in strategic locations.

Radiographic findings often reach as far back as the melt. In one case, an X-ray showed that the cause of pinholes was improper de-oxidation of the melt due to insufficient aluminum. In another case, that the core was too hard, resulting in hot tears or trapped gas. In still another, that the core was too soft, resulting in burned in metal which required too much grinding. With another product, by correlating strength tests with radiographic findings, it was possible to produce a casting from malleable iron instead of steel, without sacrifice of durability or soundness. Radiographic studies also aided in the manufacture of an unusually small crankshaft. It was found that this shaft could be cast after rapid X-rays proved the soundness of the pilot lot. This crank-shaft later withstood 50 hr of testing at 7000 rpm.

Most crankshafts are X-rayed at a 10-ft target-to-film distance; jack parts and other smaller items are sometimes done at shorter distance. Between 0.090 and 0.100 in. of lead sheet is used as a filter for soft X-rays between the product and the film; and 0.010 in. of lead sheet is placed behind the film to absorb scattered radiation, thus increasing the sharpness of the image. Fine-grain Eastman A film is used. A large 0.75 in. sheet of lead serves as a platform on which all work is done, and reduces back-scatter to a minimum. Usual exposure time for a group of crankshafts is 6 to 8 min.

To provide complete protection for personnel, the X-ray equipment is placed in a room that is 25 ft wide, 45 ft long and 35 ft high, with three walls 18 in. thick and the fourth wall, which faces the control room and office, 24 in. thick. This thickness extends to a height of 18 ft, then drops back to 10 in. The entire building is of concrete and is heated by radiant pipes in the floor. A large electrically-controlled concrete door permits entry into and exit of large apparatus from the X-ray room. An ingenious crane mechanism is provided which permits the X-ray unit to be manipulated

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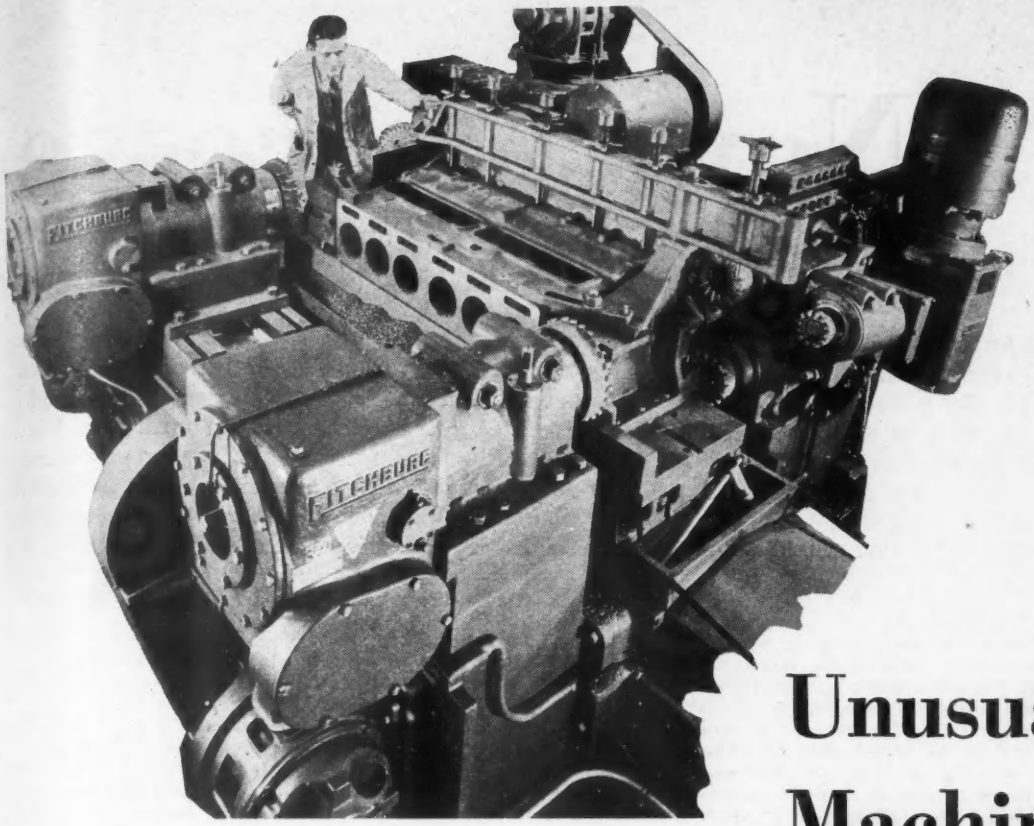


Milling machines and fixtures at Buda are designed to handle blocks of different sizes. Top and bottom surfaces of a block are milled by this large machine in a single pass

Unusual Machining Flexibility

Permits Production of Engines in Different Sizes and Types

AN UNUSUAL and economical method of producing a variety of big engines with a single-purpose but flexible machining is found at the Buda Co., Harvey, Ill. The Buda 844 series engines are virtually mass produced in four, six and eight-cylinder sizes, as either gasoline or Diesel types. Without advance planning this would require small lot building of at least six different engines of 5.25 in. bore and 5.625 in. stroke. However, through a combination of production planning and engineering design, the same fixtures are used for all models on the same machine line.

The basic block in the production plan is considered as a two-cylinder block symmetrical about the vertical center. A four simply means the addition of a cylinder at each end, with the symmetry of bores, milling pads, locating holes and drilling remaining about the vertical center. To complete the picture, the front and rear cover pattern and drilling are universally the same. Cylinder heads have the same pattern of similitude: a two has one head; a four has two heads; a six, two heads; and an eight, two heads.

What was formerly a small foundry department was converted to house the machine shops for heads and blocks by the addition of a false ceiling and modern lighting. The cylinder block department completes all operations over a group of 23 machines. The initial roughing operations, performed by a battery of new Fitchburg mills and one Ingersoll mill, are separated from the drilling department by an aisle. In planning the layout the production department enlisted the aid of the machine tool builders as well as Logan materials handling experts to achieve a compact plan with the most economical flow of work and a minimum of physical handling. For example, the operations are so arranged as to keep the case in a horizontal position with either top or bottom side resting on locating pads. Here and there they have roll-over fixtures and turntable conveyor sections for diverting flow from one machine to another.

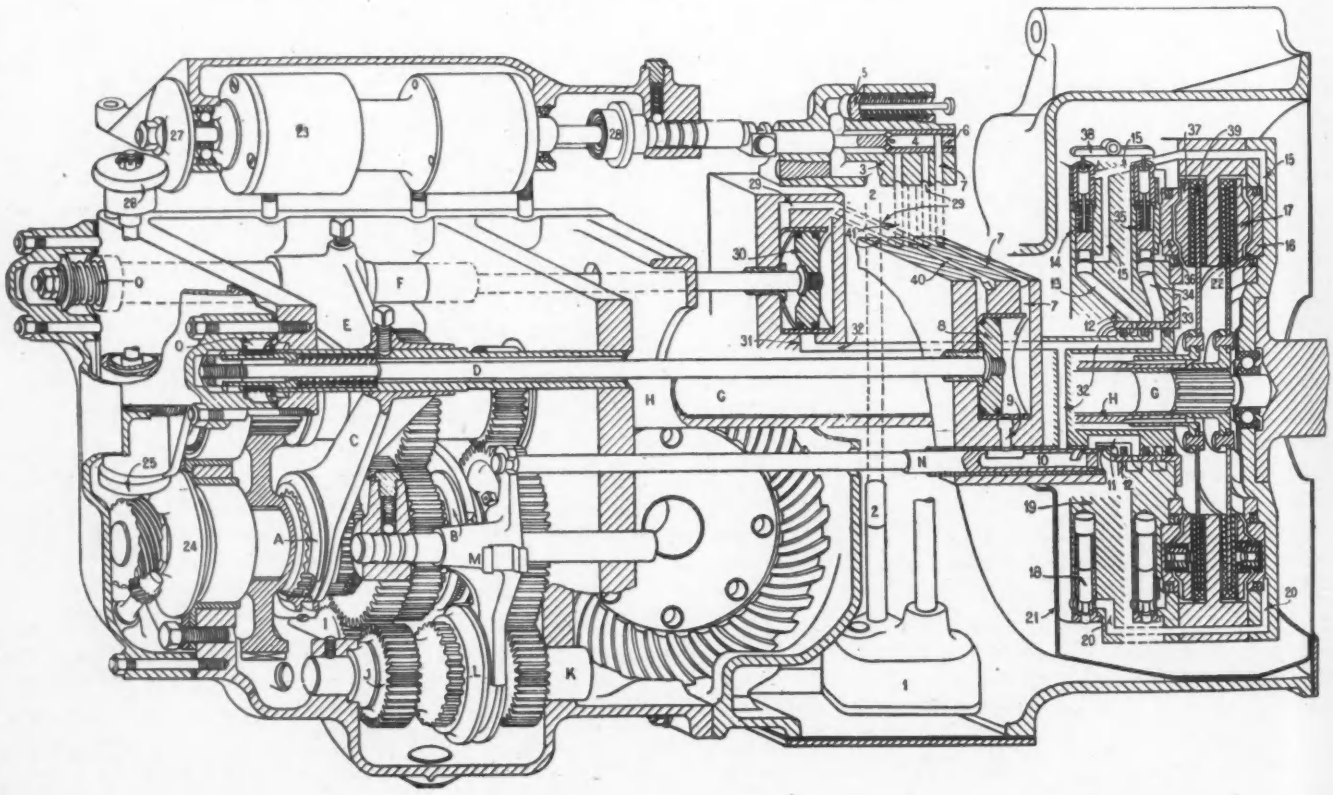
Milling machines are designed to take the largest, eight-cylinder-block, and are fitted with fixtures to hold these blocks. However, the clamping and location of individual blocks is taken care of by providing each fixture with a series of adjustments of locating dowels to accommodate for variations in length. Although, in the interest of economy, the blocks are scheduled in minimum runs, it is possible with this arrangement to change the adjustment of fixtures to suit any block at any time.

(*Turn to page* 64, *please*)

New Kegresse

THE Kegresse system, a new British development in automatic transmissions, utilizes an unusual arrangement of hydraulic pistons, controlling valves, and a centrifugal governor to provide a rapid and automatic means of shifting gears. Designed for the front-wheel drive Citroen, it is a four-speed system of indirect drive; that is, the transmission has a separate output shaft which is parallel to and below the main shaft. An engine-driven oil pump furnishes pressure for the hydraulic actuation of two friction clutches used alternately in conjunction with hydraulically-operated gear clutches. Except for a hand lever for putting the system in forward, neutral or reverse, it is entirely automatic. There is no clutch pedal, the gear changes being made in accordance with the vehicle's speed through the action of the centrifugal gov-

Fig. 1—Shown here is a cutaway drawing of the Kegresse hydraulic automatic four-speed transmission and clutch unit. The main shaft of the transmission consists of two concentric shafts, of which the inner one G carries driving pinions for 1st and 3rd speeds and is splined to the clutch disc 22. The outer shaft H carries driving pinions for 4th and 2nd speeds and is splined to clutch disc 39. Gear-clutch A, which controls 1st and 3rd speeds, is operated by piston 8 through shaft D and fork C; and gear-clutch B, which controls 4th and 2nd speeds, is operated by piston 30 through shaft F and fork E. Preloaded double-acting centralizing springs 0 are fitted to each shaft so that in the absence of oil pressure on the pistons both gear-clutches will return to neutral position. Reverse gear is hand controlled through fork M which, when moved to the left, engages gear-clutch L, reverse gears J and K and reverse idler I. Driven from the engine is an oil pump 1 which maintains a working pressure of 45 psi, limited by relief valve 5, in the hydraulic system. The 1st and 3rd speed clutch discharge valve 14 controls oil flow to the annular clutch-operating piston 16 which engages clutch disc 22 through the pressure plate 17. Similarly, discharge valve 35 controls oil flow to clutch-operating piston 36 for engaging the 2nd and 4th speed clutch disc 39 with pressure plate 37. The centrifugal governor 23, driven by the transmission output shaft through friction wheels 24, 25, 26 and 27 operates piston valve 4 through coupling 28. The action of a centrifugal valve 18 prevents a sudden engagement of the clutch, and serves to engage the 1st speed friction clutch when starting from rest. At 2, 7, 9, 11, 12, 13, 15, 20, 21, 29, 31, 32, 33, 34, 40 and 41 are oil passages and ports. Piston rod N, operated by a hand lever, controls valve 10 when the transmission is put in forward or reverse gear. The flywheel is shown at 19; a balance lever at 38; a valve body at 3; and a removable plug at 6. (Courtesy of the Automobile Engineer, London)



Transmission

Automatic Gear Shifting Actuated by Hydraulic and Centrifugal Governor Control Equipment

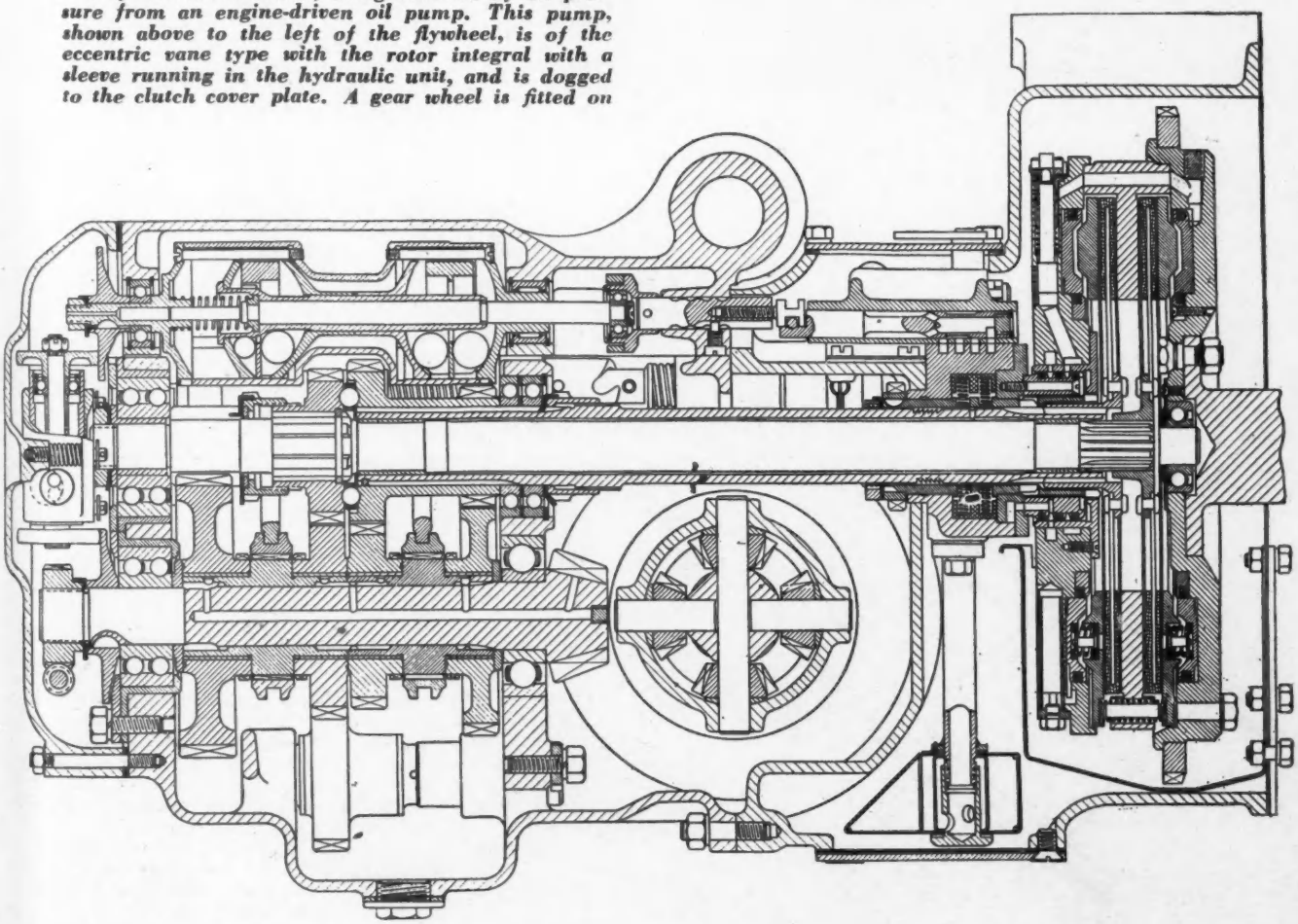
ernor. Component parts of the system are illustrated in Fig. 1, the drawing being reproduced here by courtesy of the *Automobile Engineer* (London).

The centrifugal governor is of the ball type and consists of three sections. The first section, two sets of large balls working on fairly flat cones, provides the actuating force for low-gear changes. The second, one row of slightly smaller balls working on a sharper cone, is used with second-gear; and the third section, consisting of a row of small balls is used with third gear. The intermediate friction-wheel shaft driving the governor is carried on ball bearings mounted in a sleeve which can be slid axially by a manually operated pin-crank. By moving this lever, the governor driving-ratio is altered as desired, raising or lowering the speeds at which gear changes take place. A second lever limits the travel of the governor-controlled oil valve, and can be used to eliminate 4th or 3rd gear if desired.

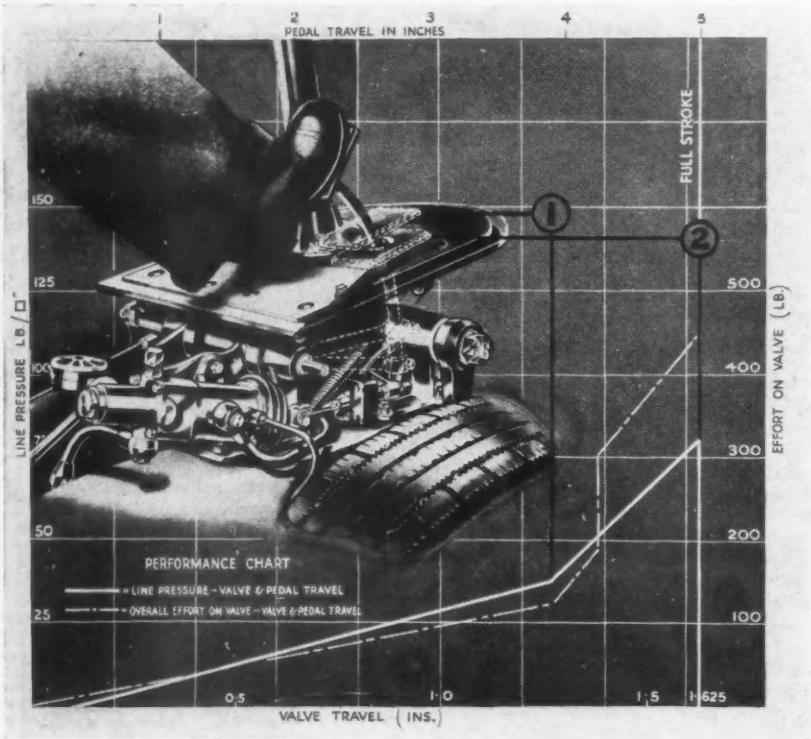
In the operation of this system, the centrifugal governor controls the flow of oil from the engine pump to

(*Turn to page 78, please*)

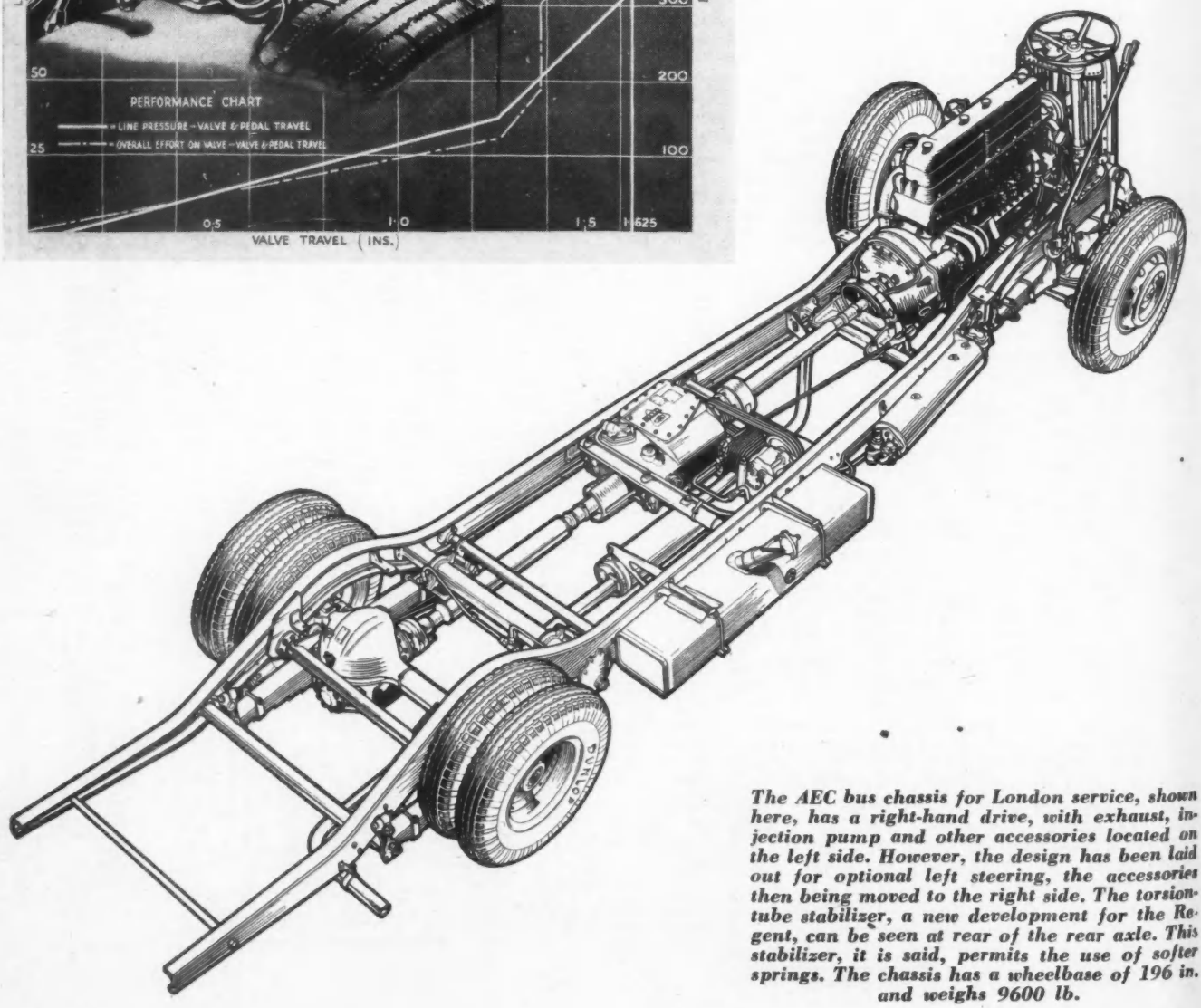
Fig. 2—The Kegresse transmission and clutch system, shown here in a sectional drawing, is mounted at the front end of the front-wheel drive Citroen, ahead of the engine, with the differential interposed between the clutch and gear train. The transmission output shaft is parallel and below the main shaft. The system is automatic, being actuated by oil pressure from an engine-driven oil pump. This pump, shown above to the left of the flywheel, is of the eccentric vane type with the rotor integral with a sleeve running in the hydraulic unit, and is dogged to the clutch cover plate. A gear wheel is fitted on the forward end of this sleeve for cranking the engine, since a handle cannot be fitted to an extension of the transmission driving shaft because the clutches are free when the engine is standing. (Courtesy of the Automobile Engineer, London)



Rear Torsion



This performance chart of the Regent air-brake system shows how air-pressure increases with increased pedal travel. For light pressure on the pedal, up to position 1 in the illustration, a maximum of 32 psi is available. For emergency use, position 2, the full line pressure of 80 psi is available.



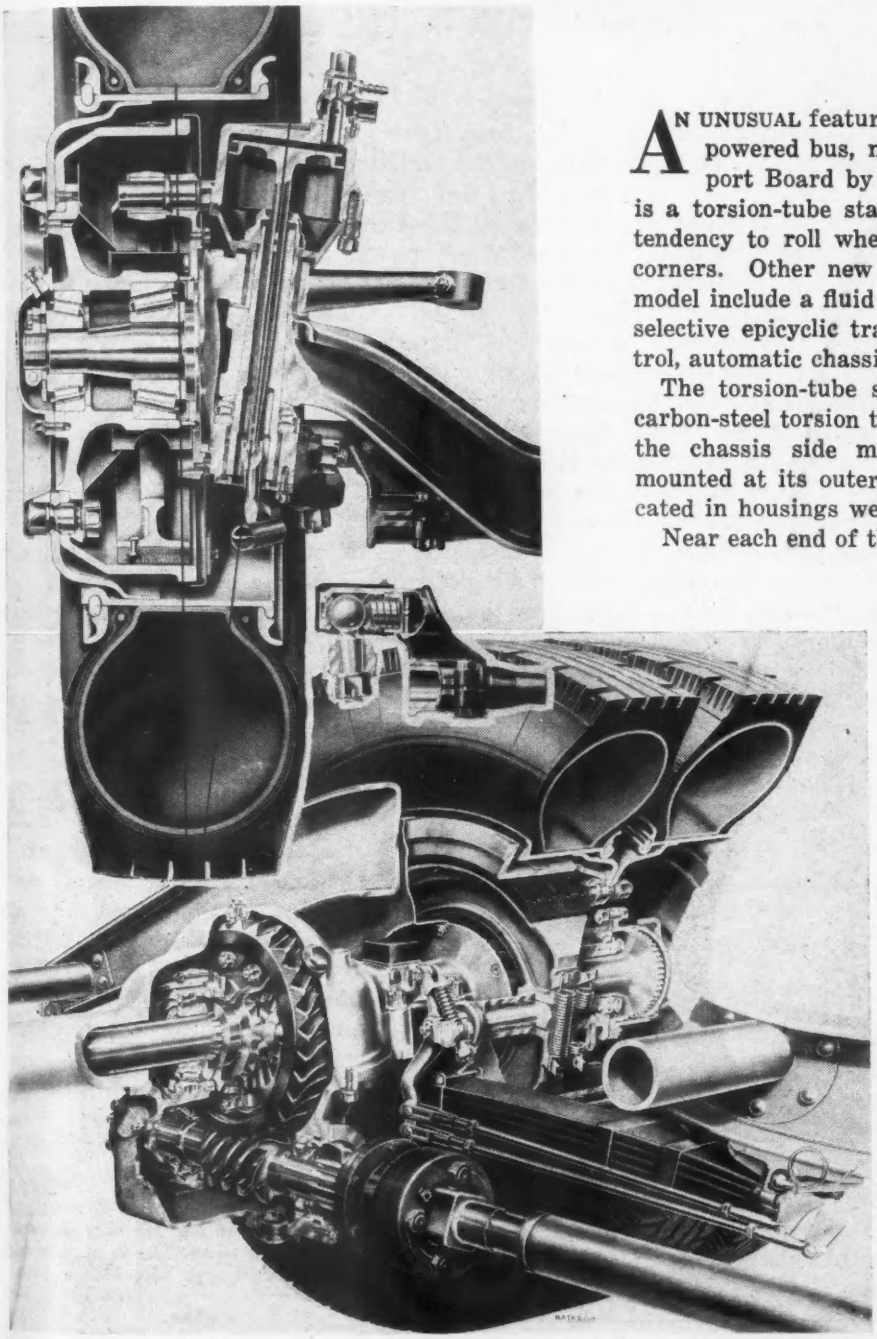
The AEC bus chassis for London service, shown here, has a right-hand drive, with exhaust, injection pump and other accessories located on the left side. However, the design has been laid out for optional left steering, the accessories then being moved to the right side. The torsion-tube stabilizer, a new development for the Regent, can be seen at rear of the rear axle. This stabilizer, it is said, permits the use of softer springs. The chassis has a wheelbase of 196 in. and weighs 9600 lb.

Tube Stabilizer

Featured on British Bus

By W. F. Bradley
Special European Correspondent
of AUTOMOTIVE AND AVIATION INDUSTRIES

Latest Type of Double-Decker Incorporates Fluid Drive, Preselective Transmission and Automatic Chassis Lubrication



AN UNUSUAL feature on the new Regent Mark III Diesel-powered bus, manufactured for the London Transport Board by the Associated Equipment Co., Ltd., is a torsion-tube stabilizer which is said to eliminate all tendency to roll when the double-decker is taken around corners. Other new design features incorporated in this model include a fluid drive for smoother acceleration, preselective epicyclic transmission with compressed air control, automatic chassis lubrication and air brakes.

The torsion-tube stabilizer consists of a high quality carbon-steel torsion tube of 3.50 in. OD extending between the chassis side members behind the rear axle, and mounted at its outer ends in rubber bushed trunnions located in housings welded to the side rails.

Near each end of the torsion tube, steel arms are welded which carry at their extremities suitable links secured by rubber bushed joints. At the bottom ends, the links are similarly secured to extensions formed integrally with the spring caps. Vertical movement is free so long as the axle remains parallel to the torsion tube. However, as soon as the chassis begins to twist relative to the axle, the movement of the links becomes unequal and the torsion bar tends to twist. Its pri-

(Top) Shown here is a cutaway view of the front-wheel assembly of the Mark III Regent. Compressed-air cylinder for the air-brake is mounted on top of the steering knuckle.

(Bottom) Cutaway drawing of the rear axle and differential of the Regent.

Standard type of bus body used in London is this double-decker Regent Mark III which can carry a total of 56 passengers on both decks. The driver's seat is located alongside the engine; and there is an inside staircase from the rear platform to the upper deck.

mary function is to tie the two road springs together, and therefore to force the axle to remain parallel to the torsion tube. For instance, if the right hand side of the axle rises appreciably more than the left, then the torsion bar and its links will tend to pull up the spring on the left-hand side until parallelism is once more achieved. A certain amount of free movement is permitted for slight road irregularities by mounting on one of the two vertical links a small steel piston operating in a cylinder and having a limited travel between rubber stops. The system incorporates a lubricator and a collapsible rubber protecting boot.

The Regent is powered with a six-cylinder Diesel of 585 cu in. displacement, 4.72 in. bore and 5.59 in. stroke. This engine develops 125 hp at the governed speed of 1800 rpm, with maximum torque output of 430 lb-ft at 1000 rpm. Compression ratio is 16 to 1. Valves are vertical in the head, and a toroidal combustion chamber is formed in the aluminum piston head, fuel being injected into it from a four-hole nozzle. A one-piece iron-alloy casting, the six cylinders are fitted with centrifugally cast-iron dry liners with detachable plates on the water jackets. The cylinder heads are in two units; and the exhaust manifold is in two sections.

Metalastik "floating-power" type of engine mounting is used, with the common axis of the front and rear rubber supports passing through the center of gravity of the engine, thus providing a true axial movement and eliminating vibration from the engine. The two mountings are carried on chassis cross members, pressed steel in front and tubular at the rear. Torque reaction is controlled by a series of serrations formed on the inner faces of the upper and lower circular clamps of the rear support, the tendency of the engine to move longitudinally during positive or negative acceleration being checked by a link between the engine and the rear cross member.

The fluid drive has been adopted to secure the progressive take-up required for smooth acceleration. Recent modifications result in fuel economy by allowing maximum freedom at idling and minimum slip at working speeds. The output shaft runs in a large-diameter ball bearing within the driving member and is located in the end of the crankshaft by a roller bearing, a lip-type oil-seal being fitted at the output end.

A four-speed preselective epicyclic transmission utilizes air pressure for making the gear changes, thus relieving the driver of the somewhat heavy leg work involved with this type of transmission. Pre-selection of the gears is effected by finger-tip control immediately under the steering wheel, but the actual change of gears is effected by depressing the gear shifting pedal which controls the compressed air to the transmission. The casing is a light-alloy casting, and is carried on two of the five tubular chassis cross members, close to the left side rail. The air compressor, mounted horizontally, is driven off its forward end by means of triple V-belts. Unless the engine is running and the air compressor working, the transmission will always be dis-

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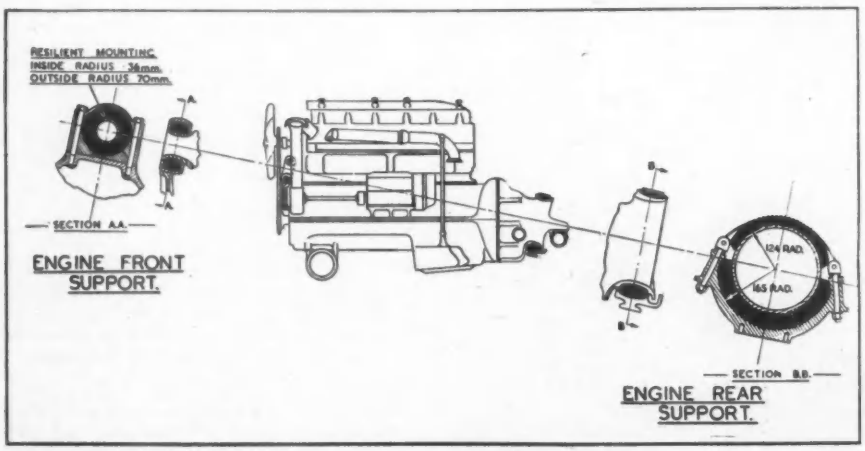
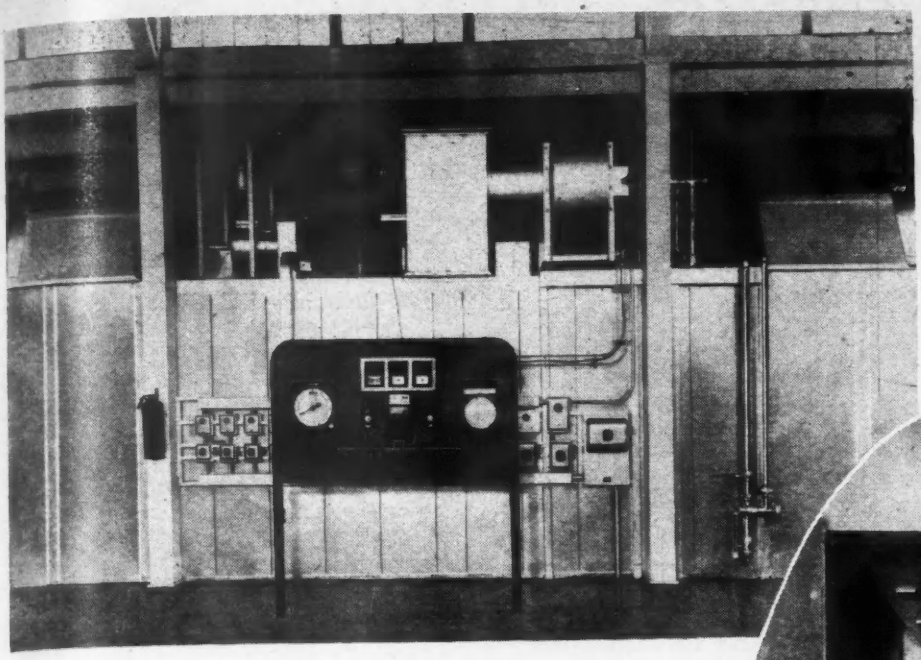
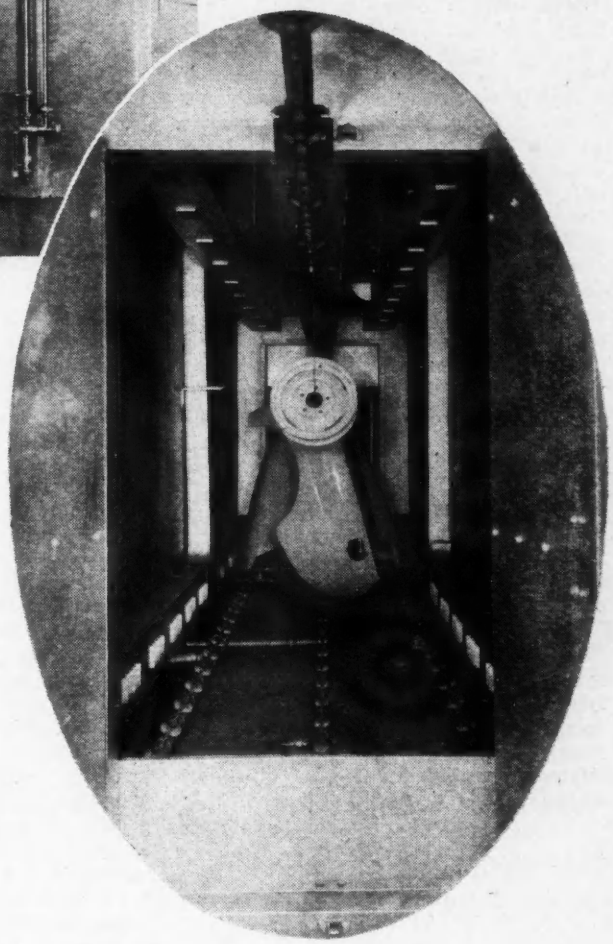


Sectional views of the Metalastik resilient engine mounting. The common axis of the front and rear mountings passes through the center of gravity of the engine.



Exterior view of Newcomb-Detroit's new paint testing laboratory. The control panel for the ovens is in the foreground; on top of the oven can be seen the spill-air fan, air seal mechanism, and heating equipment. In the oval is shown the interior of the radiant fired oven.



An Experimental Laboratory for Paint Testing

THE EXPERIMENTAL paint testing laboratory of the Newcomb-Detroit Co., manufacturers of drying ovens and spray booths, consists of a pilot finishing department containing two spray booths, two drying ovens and a closed monorail conveyor system with variable speed control. The arrangement also includes air circulation, filtering and a comprehensive control panel for temperature adjustment and recording.

This new laboratory offers facilities to car manufacturers and others in seeking solutions to paint finishing problems, and in developing improved methods and cycles. Usually, factory management experiences difficulty in making special studies in their own plant since the equipment at hand is constantly in use on production. Even vital problems of improving finish or reducing costs by varying finishes and drying cycles are difficult to approach under the circumstances.

With the aid of the new paint research department engineers or production men, bringing in a supply of their own finishes and samples of sheet metal or other kinds of product to be studied, can run a complete set of tests without delay and under ideally controlled conditions. Newcomb-Detroit engineers also are available prepared to conduct experimental work and make recommendations based upon wide experience with finishing problems.

There are two types of drying ovens in this laboratory. One is of radiant heating type; the other of remote scroll type. The latter represents best practice for drying sheet metal parts, and the first provides means for raising the temperature quickly of parts which normally require a long drying cycle. All of the equipment is designed for flexibility, thus permitting outside engineers to install their own burners and other accessories.

As an example of how these facilities may be employed, a motor car producer contemplating the use of a new type of finish, may start work with initial process specifications recommended by the supplier of the finish or by the chemical department of the company. From this starting point, progressive changes can be made in the range of drying temperature and time cycle until the most acceptable and most economical cycle has been developed.

Observations

by Joseph Geschelin

Paint Costs Cut By Electrostatic Spray

LATEST developments in electrostatic spray booth systems promise dramatic economies in production painting of sheet metal and other products. The powerful ionizing field set up in these spray booths forces the paint spray to adhere to metal in much the same way as a magnet attracts iron filings. This makes possible the use of a light spray gun pressure and a material decrease in the amount of paint consumed. Some installations, depending upon conditions, already have saved as much as 60 per cent of paint cost. Another major saving comes from the virtual elimination of overspray, reduces the need for cleaning floors and walls, and eliminates fire hazard. Although most installations are relatively new, recent work indicates the possibility of applying this method to the finishing of complete car bodies.

Secret of the major economies claimed for the process is that paint spraying becomes a completely automatic operation — whether it be for small parts or a car body—without the usual complication of mechanical or electronic controls for the operation and movement of spray guns.

Good Riding On All Roads

EVIDENTLY a great deal of new work is being done in the development of advanced types of suspension systems for motor cars not only in Detroit but elsewhere. One organization in Detroit is reportedly conducting road testing on a unique suspension said to produce good riding quality on all kinds of roads. They are not yet ready to divulge the details but may be in position to do so in the near future.

National Machine Tool Show

MANUFACTURING executives will recall the magnificent machine tool expositions held in 1929 and 1935. Now for the first time in 12 years the Machine Tool Show will be held in September, 1947. This one will dwarf the others. Space in the Chicago-Dodge plant now leased by the Tucker Corp., is so ample as to provide exhibitors with over 500,000 sq. ft. of floor space in one rectangular area. No more ducking around corners and under balconies; no more climbing of winding stairs. Although the plans for exhibits remain to be announced, we are betting on a big play for the transfer type machinery such as was described in this publication Feb. 1, 1947, covering the Buick cylinder block line. Another feature will be the Machine Tool Congress, a series of evening technical sessions set up by leading engineering societies to provide profitable diversion during the ten day show.

Depreciation Allowances

MACHINE tool manufacturers are engaged in negotiations with the Department of Internal Revenue to liberalize the present outmoded depreciation allowances on productive equipment. What they are after is to scrap the principle of "useful life" and substitute in its stead a so-called "free" depreciation based upon obsolescence. In the automotive industry where equipment may be amortized within a year or less and sometimes discarded within that period to make way for advanced methods, the allowable rate should be in keeping with actual practice. If this principle were adopted, it would permit plants to recover their capital outlay quickly and make funds available for modernization. By the same token, it is hoped this will encourage real depreciation reserves with cash available for the purchase of new machinery.

To Treat or Not to Treat

ONE of the large manufacturers has raised the question: can a soluble oil of one type be expected to emulsify readily with the water available in widely scattered plants; or is it desirable to remove water hardness in each locality. We have had replies urging one method or the other, thus indicating a diversity of practice. We should like to hear from some of our readers. Do you treat the water or do you depend upon the emulsifiers in the soluble oil to do the softening job.

Lighting Institute

ON a recent journey to Cleveland we took advantage of an invitation to go through the G. E. Lighting Institute at Nela Park. The advances made in lighting techniques and light sources to improve seeing are nothing short of remarkable. Everyone responsible for the design of a new plant or improvement of existing facilities should spend a few hours or a day of profitable observation at the Institute. It would certainly pay off in improved working conditions at machines, at inspection benches, and in drafting rooms.

Powdered Metal Oil Pump Gears

THE fact that oil pump gears are made of powdered iron is not news. But we hear that one of the companies specializing in powder metallurgy is developing a new type of oil pump. Its feature, as we understand it, is the use of a pair of meshing gears having a special gear tooth form conducive to high efficiency operation. Since the project is still in the experimental stage there is little more we can say about it. When the job has made the grade in service, we'll have the complete story for you.

Machine Tool Simplification

MASTER mechanics will be interested to learn of a program initiated by machine tool builders to simplify the electrical equipment and wiring of machine tools. The program will be presented to automotive users for study and recommendations before its adoption. Some impression of the growing use of individual motors for modern machines may be gained from a recent statement that multi-motored machines have on the average 5.7 motors per unit.

Automatic Transmissions

FOR 1948 models there is seething activity in the sphere of automatic transmissions. One large motor car producer is currently experimenting with a unique geared transmission with hydraulic controls. Still other manufacturers are working feverishly on the development of an acceptable torque converter. Basic problem with torque converters is the necessity for a gear box to provide the reduction for acceleration as well as reverse gearing. Thus engineering management is faced with the serious responsibility of deciding soon whether to use one type of automatic device or another or to wait on future developments.

New Production and Plant EQUIPMENT

B-27—New Automatic Turret Lathe

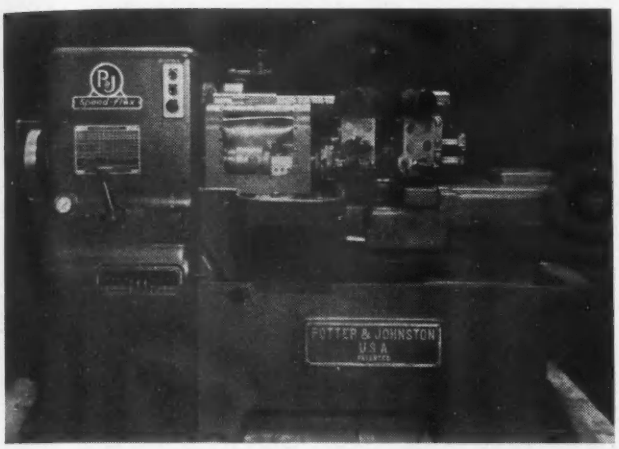
Potter & Johnston Machine Co., Pawtucket, R. I., has placed on the market a new machine known as the 3U Speed-Flex automatic turret lathe. Among its features are hardened and ground steel ways for the turret slide mounted on the base, hardened and ground steel inserts in the turret slide, and electro-pneumatic control of speed and feed changes and rapid traverse.

The new 3U type is arranged for spindle speeds of 73 to 1445 rpm, or as optional equipment dual speed ranges of 36 to 711 rpm and 73 to 1445 rpm. Swing over the cross slide is 8¾ in., chuck equipment is six in. in diameter, and turret slide travel is six in. Multiple disk clutches are employed for speed and feed changes; and change from rapid traverse to feed, or vice versa, can be made in 1/5 second. Antifriction bearings are employed for the mounting of all high-speed shafts and spindles.

Movement of heads horizontally on the ways is accomplished through a single hydraulic cylinder and by means of a rack and pinion drive.

The hydraulic indexing fixture has six stations. Work pieces are fed from a hopper automatically and held by direct chain clamping method. All functions of the machine are automatic.

The cycle of the machine is such that after the head drive hydraulic and coolant motors have been started and the cycle start button pressed, the machine will continue in its cycle of rapid advance, feed and rapid return. This cycle is repeated until either the cycle stop, master stop, emergency return or safty stop button is actuaed. Safety features are provided.

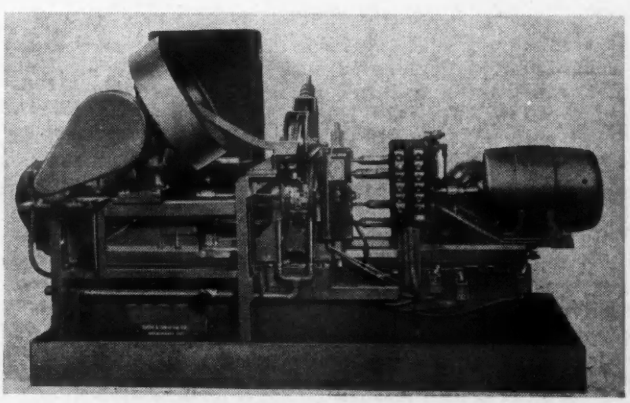


3U Speed-Flex Automatic Turret Lathe

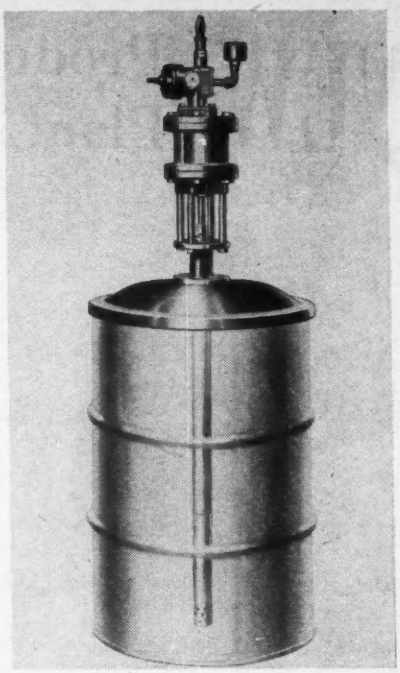
B-28—Drilling and Reaming Machine

The Davis & Thompson Co., Milwaukee, Wis., has just completed an automatic horizontal drilling and reaming machine designed primarily for performing these operations on wrist pins. This machine has been designated as type HI-12. The design is flexible to the extent that the machine can be adapted to similar work varying in size and shape of part.

Two opposed drilling heads are provided mounted on a common bed. Power is supplied by two 7½ hp motors.



Davis & Thompson HI-12 automatic horizontal drilling and reaming machine



Aro Drum Pump

B-29—Air-Operated Drum Pumps

A new line of air-operated heavy duty drum pumps designed for the requirements of factories and all other large volume users of motor oil and lubricants, has been introduced by the Aro Equipment Corp., Bryan, Ohio.

These heavily constructed Aro Pumps will handle lubricants, oils, and also sound deadeners, sealing materials, paints, and many other compounds direct from original containers of 55 gallons capacity.

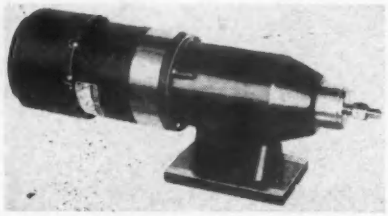
The pumps are available in drum cover types for full opening drums, and in bung-bushing types for mounting in drums equipped with two-in. P.T. bunghole. Both types are offered in seven pressure ratios, from 40 to 1 to 2 to 1, for any material requirement.

B-30—Automatic Tapping Unit

The Govro-Nelson Co., Detroit 8, Mich., offers a new tapping unit, the Model KT, for single or multiple operation in any plane and at any angle. Major feature of the unit is automatic, centrifugal-fed operation employing a free-rolling centrifugal weight design.

The Model KT operates at a spindle speed of 1800 rpm, has a maximum

NEW Production and Plant EQUIPMENT



Model KT Govro-Nelson tapping unit

stroke of 1¼ in., and maximum collet capacity of ¼ in. Centrifugal feed is suitable for any number of threads per inch. With an accurate tap, properly ground and aligned, the unit will produce Class 4 threads consistently. It can be specified with or without a lead screw attachment. Tap idles in reverse but runs clockwise before moving toward the work.

B-31—Trackson Co. Expands Line

With the announcement of the Model T6 Traxcavator, Trackson Co., Milwaukee 1, Wis., has expanded its line of tractor-excavators to four, for four sizes of "Caterpillar" track-type tractors. The full line now includes bucket capacities ranging from ½ to 4 cu-yd. The T6 Traxcavator is mounted on, and engineered as a unit with the "Caterpillar" D6 tractor. Buckets of 1½ or 1¾ cu-yd rated capacity are standard with the new T6. Quarry, heavy duty and other buckets for special uses can also be supplied. A bulldozer blade, interchangeable with the bucket, also is available.

B-32—High-Speed Temperature Indicator

The Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa., has brought out a high-speed instrument that can handle a large number of separate temperatures. Known as the Speedomax indicator, it is used where a large number of thermocouple temperatures must be logged in a short time.

Switching arrangements can be supplied to meet the needs of practically any application. A single instrument easily handles more than 100 thermocouples. Key switches can be color-coded for convenience in identifying points.

The indicator uses the same case as strip-chart Micromax and Speedomax recorders, and fits into standard panel cutouts for these instruments.

All the more commonly used ranges for industrial thermocouples can be supplied.

Speedomax Indicator

B-33—Rustproofing Infra-Red Rays

A new development of the Burdett Manufacturing Co., 3433 W. Madison St., Chicago, Ill., is rustproofing by infra-red rays. An advantage of this process is that degreasing and rustproofing are done simultaneously.

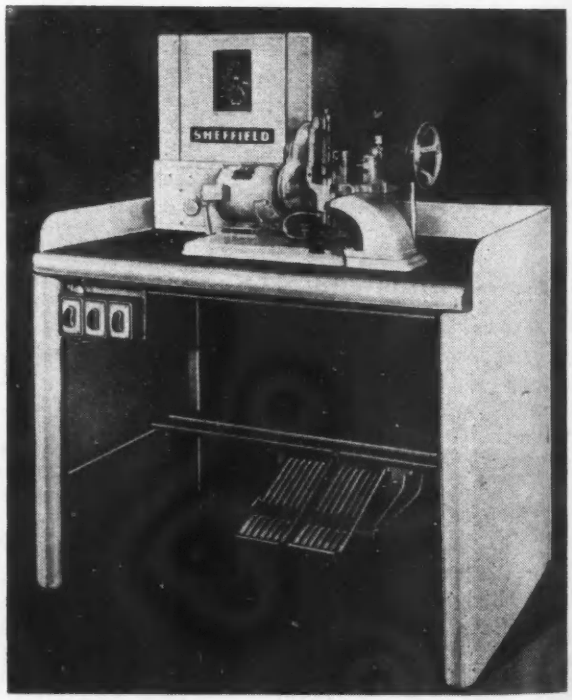
The new Burdett Burn-Off Rust-

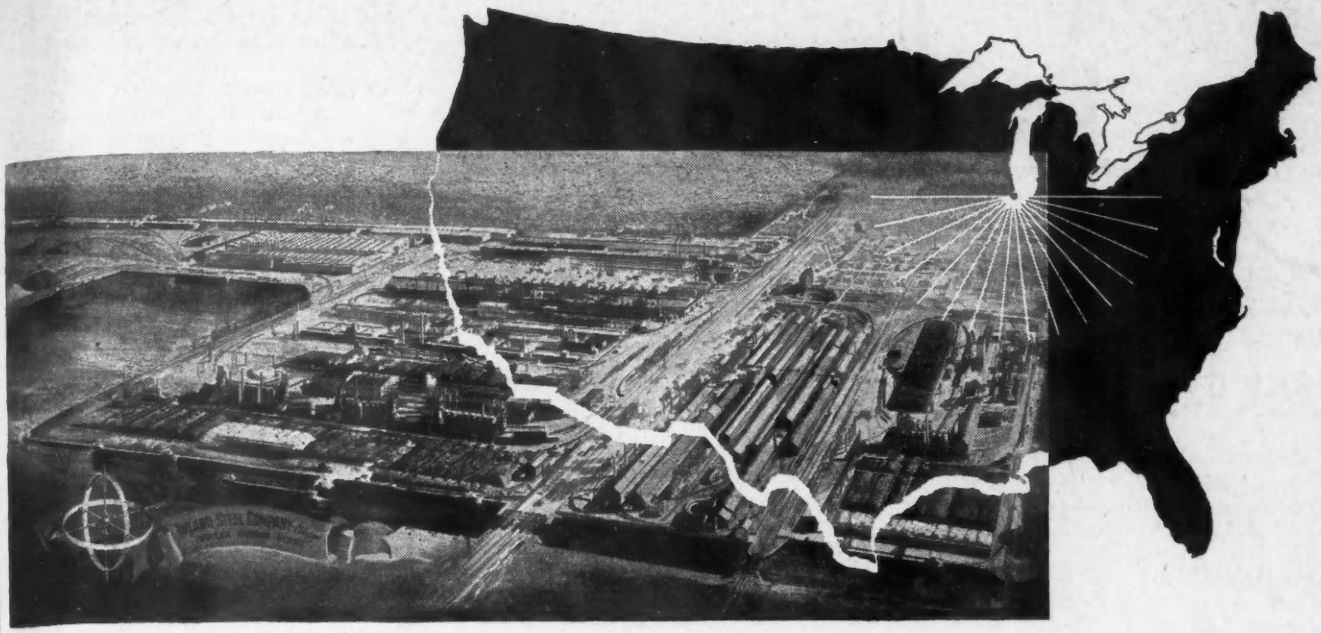
(*Turn to page* 85, *please*)

Model T6 Traxcavator mounted on Caterpillar D6 tractor

B-34—Automatic Welding Machine

This is one of the newly announced automatic welding machines made by the Sheffield Corp., Dayton 1, Ohio. They are made in contact point or disk welding type. With either type of machine the accurate and secure placement of electrical contact material on contact springs can be accomplished at a high rate of production. The spring is loaded in a suitable holding fixture and moves through a series of stages. In the case of the disk machine, it involves the punching of the disk and placing it at the proper location on the spring, welding the two securely together, and the final operation of shaping the contact to the required flatness or contour.





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Throughout its entire history and growth, Inland has been guided by a desire to render better service to American Industry. This desire is mirrored in Inland's modern research laboratories, in Inland's reputation for close customer cooperation and in the quality of Inland products.

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Airbriefs

by Robert McLarren

Nazi V-2 Wind Tunnel

General Electric engineers engaged in research work on ramjet engines for supersonic guided missles have adapted the Nazi V-2 as the fastest and largest supersonic wind tunnel. Struck by the fact that the V-2 travels at a speed of Mach number 4 to 6 (depending upon altitude), Dr. R. W. Porter of GE designed a special nose for the V-2 containing an inlet diffuser of a ramjet engine. (The inlet diffuser is designed to slow down the incoming air and convert its speed into pressure.) The diffuser was instrumented with 23 pressure orifices which transmitted pressure distribution readings via telemetering equipment to the ground. Radiosonde balloons released over the launching site at White Sands, New Mexico, provided accurate pressure and temperature readings up to 100,000 ft to be used as reference points for the telemetered data. The launching of the device took place several weeks ago and plans for future tests are well advanced. Existing wind tunnels are neither fast enough nor large enough to accomplish this work, Dr. Porter points out. The captured Nazi V-2 missles have proved immensely valuable basic research tools for American scientists. The AAF recently announced that the V-2 is now obsolete as a military weapon, permitting the obvious assumption that bigger and better U. S. missiles are now available.

Guided Missile Impasse

Dr. Jerome C. Hunsaker, Chairman of the National Advisory Committee for Aeronautics, recently stated that characterized the present status of guided missile work as "ambitious development responsibilities in an unexplored field in advance of the availability of the necessary research information." Both the Army and Navy are pressing development work on production quantities of guided missiles without the availability of the required basic research data on which practical design must be based. Although the aerodynamics of numerous configurations are well in hand, stability and control problems with accompanying shortcomings in servo-mechanism and remote-control equipment render them impractical at this stage of the game. An AAF spokesman, however, points out that the simple fact that development has drawn abreast of, and even surpassed basic research, is a tribute to engineers and a history-making event in aeronautical history (during which development has always lagged from 5 to 10 years behind research).

First 75st Data

Although it has found wide-spread application to aircraft construction, quantitative data on Alcoa 75ST have become available for publication in a paper delivered before the SAE National Aeronautic Meeting by George Snyder and Frank J. Crossland, Boeing engineers. In general, the Boeing engineers believe that the substitution of 75ST for the familiar 24ST can result in weight savings of 14 per cent in tension members and 35 per cent in compression members, an average weight saving of about 25 per cent in an airplane. The new alloy is made up of 5.5 per cent zinc, 2.5 per cent magnesium, 1.5 per cent copper and the remainder aluminum. In the redesign of the Boeing B-29 Superfortress wing for the new Boeing B-50 now in production, a total weight saving of 650 lb was accomplished with an actual increase in wing strength of 16 per cent. The changes involved only the spars and inter-spar structure, the remainder of the wing being 24ST. A weight saving of 800 pounds has been achieved in the new Douglas DC-6. At the present time, however, 75ST cost about 29 per cent more than 24ST in sheet form and about 31 per cent more in extruded form.

New Martin Wing

The Glenn L. Martin Co. is breaking sharply with convention in the fabrication of the Model 3-0-3 wing in a single assembly. Historic practice has been the use of a center section (either integral with or bolted to the fuselage and containing nacelles and landing gear) with two outer panels, this practice making for ease of assembly and disassembly for repair and replacement. Martin claims a weight saving of 100 lb through this type structure and increased strength by virtue of continuous stiffeners from tip to tip. This innovation will be watched with interest by other manufacturers who believe the difficulty of replacement warrants rejection of this system. The 3-0-3 is the pressure-cabin version of the 2-0-2.

Straight Flight Indicator

Unknown to the layman, one of the most difficult piloting jobs in aviation is flying an airplane straight! Fortunately this is of comparatively little importance in normal operation with frequent changes for drift due to wind being the rule rather than the exception. It has, however, been a major problem in aerial mapping where the flying of straight, parallel lines is essential. The AAF has announced a Straight Line Indicator which has already proved capable, in tests, of flying an airplane over 125-mile flight lines with a general deviation of only 250 feet! The device makes use of war-developed Shoran equipment consisting of two ground stations which retransmit high frequency radio waves transmitted from the airplane. The Straight Line Indicator receives the pulses from these two stations and actuates a pointer moving along a grooved metal path. A deviation from straight flight moves the pointer and registers on the pilot's instrument panel. Work is now under way on connecting this system with the automatic pilot of the aircraft in such a manner that the airplane's flight path is automatically corrected without the assistance of the pilot. Commercial application of the device would permit shortening the flight miles of transport planes and, more important, enable far more precise traffic control of en route airliners.

Atomic Energy for Aircraft

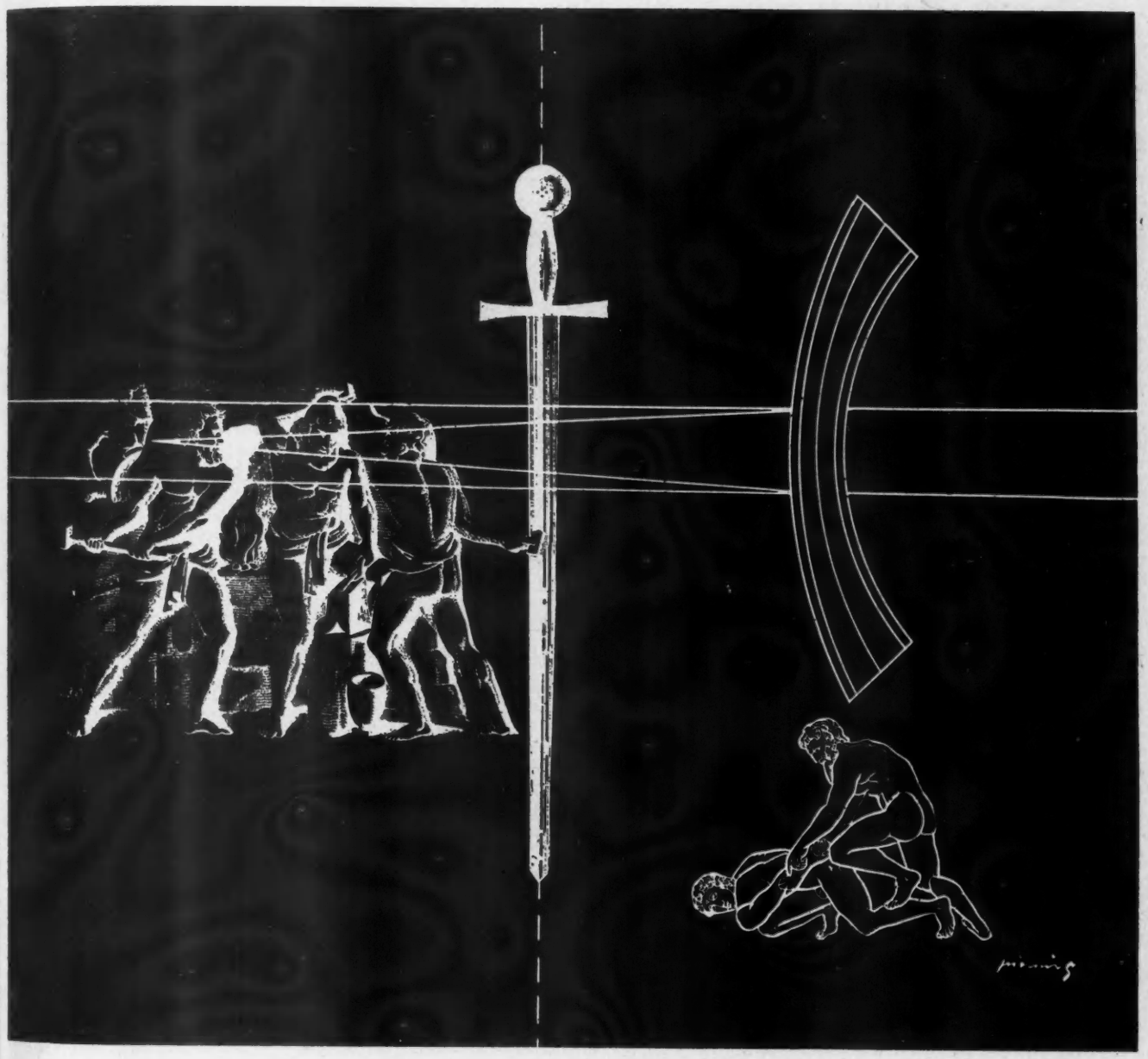
Despite continued informed pessimism, the Army Air Forces is pressing its broad research program on the application of atomic energy for aircraft. The project, NEPA (Nuclear Energy for Propulsion of Aircraft), is under the direction of Maj. Gen. Curtis E. LeMay, AAF director of research, and includes contracts with the Allison Division of General Motors, Continental Motors Corp., Frederick Flader, Inc., Lycoming Division of Avco Corp., Menasco Mfg. Co., Northrop Aircraft, Inc., Pratt & Whitney Div., United Air-

(*Turn to page* 64, *please*)

ONE CAME BACK

One of the legends surrounding the making of Damascus sword blades is that the smiths developed a delayed quench consisting of thrusting the heated blade into the body of a slave. This gave the required properties, but it was prodigal of manpower, and inconvenient besides. The smith usually had to leave town to do his heat treating in quiet.

Today, metallurgists can obtain properties they need in steel by simpler, less improvident means. A little molybdenum is one way of doing this. It is a proved means of obtaining the hardenability that assures good performance in service. Practical working data on molybdenum steels are available from Climax upon request.



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Publications listed in this department are obtainable by subscribers through the Editorial Department of AUTOMOTIVE *and* AVIATION INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

A-121—Soluble and Protective Oils

Oakite Products, Inc.—Two informative, illustrated booklets giving many specific production suggestions for improved machining, cutting, grinding and related operations on ferrous and non-ferrous metals and for preventing formation of rust on ferrous surfaces between machining operations. One booklet discusses the applications of Oakite Soluble Oil and Oakite addition agents for meeting unusual or special machining problems, gives starting point formulae for making up Oakite coolant emulsions for operations on steel, brass, aluminum, plastics, etc. A special section covers helpful tips concerning correct mixing procedures for coolants to avoid inverted emulsions. The second booklet provides data on temporary or semi-permanent rust protection of ferrous parts or work with Oakite Special Protective Oil, following grinding, machining, pickling, brazing, etc., operations.

A-122—Highway Statistics

Public Roads Administration, Federal Works Agency—A pamphlet presenting the 1945 series of statistical and analytical tables of general interest on the subjects of motor-fuel consumption, motor-vehicle registration, State highway-user taxes, State highways financing and highway mileage, may be secured by writing to United States Government Printing Office, Washington 25, D. C. The price per single copy is 35 cents.

A-123—Resistance Welding Controls

Westinghouse Electric Corp.—An 18-page illustrated booklet describes Synchro-Trol, a new line of synchronous-precision, a-c resistance welding controls in a complete, unified, factory-assembled package. Also described is the company's complete line of nonsynchronous controls, Weld-O-Timer, that makes available any desired combination for sequencing and timing from only four factory wired subassemblies and two supplementary subassemblies. Booklet number is B-3839.

A-124—Hy-Draulic Machine Tools

Rockford Machine Tool Co.—A new, comprehensive, full line catalog, giving information relating to Rockford Hy-Draulic Machine Tools has been issued. It is divided into seven sections: the Hy-Draulic story; planers; shapers; slotters; shaper-planers; special installations and representatives. Specifications data is supplied for each machine type.

A-125—Stainless-Clad Steels

Lukens Steel Co.—Bulletin 338 describes the new Lukens clad steel line and gives applications for the most important types of stainless cladding. Various steps in the Lukens method of producing stainless-clad steel are illustrated to show how uniformity of cladding thickness is maintained and a permanent bond insured. Several pages of corrosion data, size and weight tables, and photographs, are included.

A-126—Profilometer Equipment

Physicists Research Co. — A new illustrated catalog on Profilometer equipment for measuring surface roughness in microinches is announced. It covers the direct reading Profilometer, the manually operated general-purpose Type MA Tracer and the complete line of accessory tracers for measuring in extra-deep holes, on small ID's, on gear teeth and in narrow slots and grooves. All items listed are illustrated and described in detail and specifications and prices are included.

(*Turn to page* 67, *please*)

TIME SAVER COUPON for your convenience in obtaining, without obligation, more information on any one or more of the publications described above OR *New Production and Plant Equipment* OR *New Products items described on following pages.*

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Before and after —

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Add one quart of Permatex Toon-Oyl to the crankcase oil...and let the car idle. Sludge and carbon-gum binders will dissolve quickly. Valves, piston rings, oil lines and oil screens will operate freely. Then you'll have a clean engine . . . ready for all your mechanical adjustments.

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The best procedure is to drain out the old crankcase oil (with its dissolved sludge and gum) and replace with fresh oil containing one quart of Permatex Toon-Oyl. Then the car owner will get easier starting, snappier pick-up, more power and smoother driving.

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PERMATEX COMPANY, INC., BROOKLYN 29, N. Y.

NEW Products for AIRCRAFT

C-33—Magneto Test Machine

Greer Hydraulics, Inc., and the Scintilla Magneto Division of Bendix Aviation Corp., recently entered into an agreement by which Greer Hydraulics will design, manufacture, and market all test equipment for the Scintilla low-tension magnetos. These low-tension magnetos are designed for use on late model aircraft engines such as the Wright Cyclone Model R3350.

Model MG-1 test machine

The aircraft magneto test machine, Model MG-1 shown in the illustration, was designed to meet the test requirements of the Scintilla low-tension magnetos. The machine is completely self-contained and is powered by a three-hp infinitely variable speed hydraulic drive. Two spark gap banks are provided with 18 adjustable gaps and 18 coils for each bank. A suitable mounting pad is provided for mounting one magneto and two distributors. Some of the features of this machine are: Ample power to test latest type low-tension magnetos; infinitely variable stepless speed changes throughout the full range of operation; and fluid drive to eliminate rpm drop when load is applied.

C-34—Wright Cyclone 18BD Engine

A new aircraft engine engineered and produced exclusively for airline use has been announced by the Wright Aeronautical Corp.

The Cyclone 18BD engine has been type certificated at 2500 hp by the Civil Aernonautics Administration, and is now in quantity production. This engine powers the latest models of the Lockheed Constellation, soon to be placed in scheduled airline operation. The new features and the higher power rating of the Cyclone 18BD are said to provide an increase in both take-off power and cruising power at altitude, and further increase the margin of safety.

C-35—Portable Radio

Latest addition to the Flightweight line of communications equipment of the Bendix Radio Division of Bendix Aviation Corp. is an Airmarine portable radio. Created especially for personal planes and private boat operators, this nine-lb unit covers three bands which are clearly indicated on a slide rule dial.

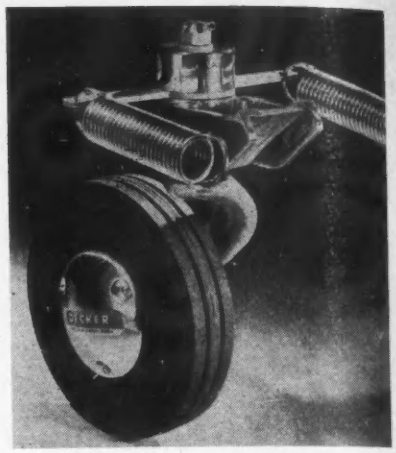
The three bands covered in this unit are 195-410 kc to provide reception from airport control towers, civil airway stations, radio range stations and marine radio beacons, 540-1620 kc for broadcast programs, and 2000-5800 kc for marine communications. A range filter is built in for the 195-410 kc band in order to assure clear reception of weather reports and civil airway control. The receiver is operated by the use of four knobs—on-off switch for battery or ac-dc, band switch and range filter, volume control, and tuning control.

Reception in pleasure boats or aircraft will be powered by a self-contained 150 hr A-B battery pack, but the set may also be plugged into a 110-volt ac-dc outlet when such is available. A dynamic loud speaker is built into the case for all normal reception. For use on weak signals, headphones may be plugged into the jack provided.

Bendix Airmarine radio

An on-off switch in the cover latch shuts the receiver off when the cover is closed, even though the main switch is in contact position. Overall measurements of the case are 6½ in. by 11 in. by 12¾ in.

C-36—Steerable Tail Wheel



This steerable tail wheel, made by Decker Manufacturing Co., 4801 S. Main St., Los Angeles 37, Calif., is said to offer positive action at any ground speed and full swiveling action for moving light planes on the ground. The manufacturer says that it will not go into full swivel without using full rudder and brakes, even when the plane is intentionally ground-looped up to 90 deg.

C-37—Three Hydromatic Propellers Approved

Three models of the reversing Hydromatic propeller, produced by Hamilton Standard Propellers, Division of United Aircraft, East Hartford, Conn., have received the approved type certificate of the Civil Aeronautics Administration, releasing them for use on commercial aircraft. The propellers will be installed on Martin 202 and 303, Consolidated 240, Lockheed 649 Constellation and Douglas DC-6 airplanes.

One of the models, that intended for the DC-6, uses improved thinned-down duralumin blades, while the other two are equipped with variations of the division's new hollow-steel blade. Diameters range from 13 ft for the 202's propeller to 15 ft for the Constellation.

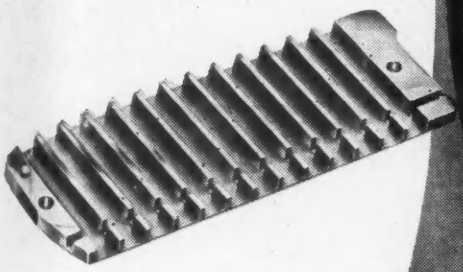
C-38—Bobrick Cable Tension Regulator

High-altitude flights, in temperatures of —40 F to —65 F present unusual problems. One of these is the contraction of metal airframes and control

(*Turn to page* 80, *please*)

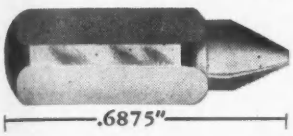
Drilling and milling to these close tolerances was once a prize headache But now each operation is done faster because of the *consistent uniformity* of Carpenter Free-Machining Stainless No. 5.

CHECK HOLES IN RELATION TO SLOTS
CHECK DRILLING TO GAGE
MILLING CUTTERS TO ENTER THIS SIDE
LOCATING SLOT FOR ALL OPERATIONS
IMPORTANT CHECK WHILE SHEARING
KEEP TO HIGH LIMIT
#46 DRILL - 2 HOLES C'BORE 7/64" DIA AS SHOWN
FILE BURRS FOR LOCATING EDGE ON ALL OPERATIONS
PART: FOR OFFICE MACHINE
MAT'L. CARP STAIN. NO 5 (TYPE 416)



You Can Turn It Out *for less*

with Carpenter Free-Machining Stainless



The point on this carburetor needle is made to close tolerances and the needles are produced economically, thanks to the easy machining properties of Carpenter Stainless No. 5. The special cold drawn shape as supplied from the mill also reduced the total amount of machining needed on the job.

• Easier Stainless Fabrication • Lower Unit Costs

Helping you to machine parts from Carpenter Stainless at less cost is as much a part of our work as the making of uniform, easy-cutting Stainless Steels. So whenever you run up against a problem of selecting and working with the Stainless that will do your job best, make full use of our experience Your nearby Carpenter representative can give you personal help in the shop and supply you with printed information to help you shave costs on each Stainless machining operation. For example . . .

Here's complete information to help you machine stainless steel at less cost . . .

This NOTEBOOK contains useful information, much of it never before published. It will give you hints to take the kinks out of Stainless machining jobs, reduce rejects and cut costs.

Your nearby Carpenter representative will be glad to give a personal copy of the "NOTEBOOK on Machining Stainless Steels" to Production and Management Executives. And after you have used the NOTEBOOK, if you want additional copies for the men in your plant, they can be secured at 50¢ apiece.

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STAINLESS STEELS

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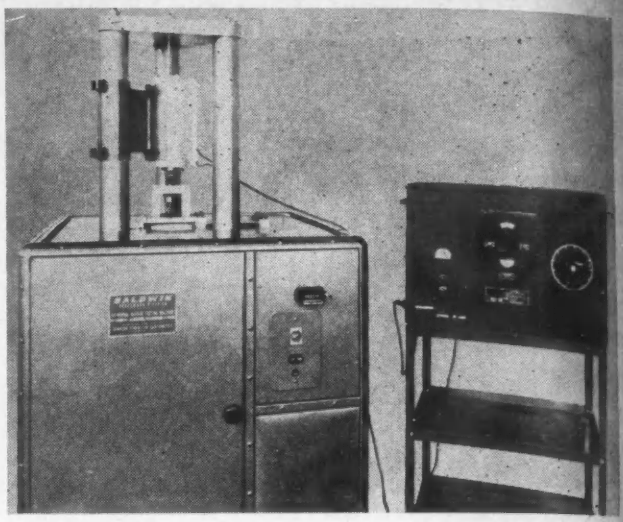
NEW Products



Baldwin SF-4 fatigue testing machine

C-42—Pratt & Whitney Testing Devices

Two new products of Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford 1, Conn., are the Model C electro-mechanical lead tester and a contour gage for checking the cam contour of centerless cam ground pistons.

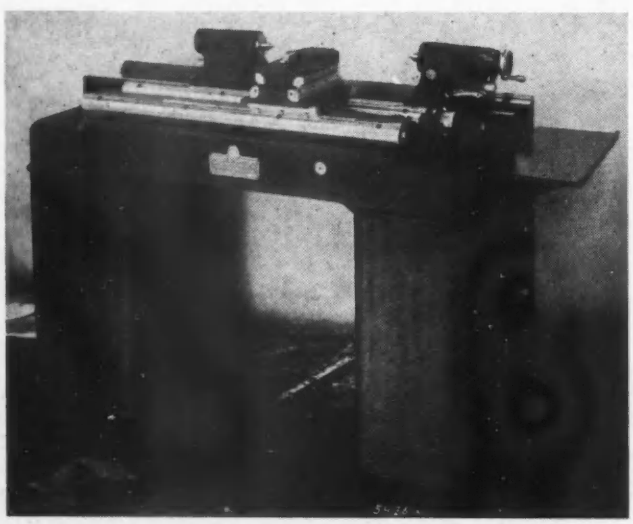
Pratt & Whitney Electrolimit contour gage

The Model C electro-mechanical lead tester is used to check lead errors of commercial threads on a large variety of sizes. Workpieces up to 10 in. in diameter and 30 in. long can be held between the tailstock centers. Work longer than 30 in., ranging from ½ in. to 3 in. in diameter, can be checked by using V-block work supports. Twenty-six in. of threads can be checked in one setup. Taper threads are checked in the same manner as straight threads with no special setup required.

The measuring head is a standard P&W Supermicrometer headstock mounted on a special base. The spindle is graduated in increments of 0.050 in. The dial has 50 graduations of 0.001 in. each, with vernier which reads directly to 0.0001 in. This spindle subdivides any given inch along the work, while even inch increments are obtained by using precision end measures. Through the use of this headstock, lead readings can be taken between each individual thread quickly and accurately.

The thread locating head is a standard Electrolimit universal circuit head with ball point holder and ball point. This head operates the meter which is located on the measuring head. By turning the dividing screw on the measuring head the ball point is centered in the vee of the thread. The desired measuring point is reached when the meter indicates zero. The lead is then read directly on the measuring head.

The Electrolimit contour gage affords and accurate means of checking the cam contour of automotive pistons. This gage is a two-station gaging fixture designed for checking the cam contour of centerless cam ground pistons. It consists of a floating pressure shoe arbor mounted on a slide, so that the arbor may be pulled out to install the piston for gaging and to remove the piston after it is measured. The arbor assembly rotates through an arc of 180 deg. Two Electrolimit heads are used tc indicate the cam contour. Each head has a floating gaging point and a fixed pickup point.



Pratt & Whitney electro-mechanical lead tester Model C

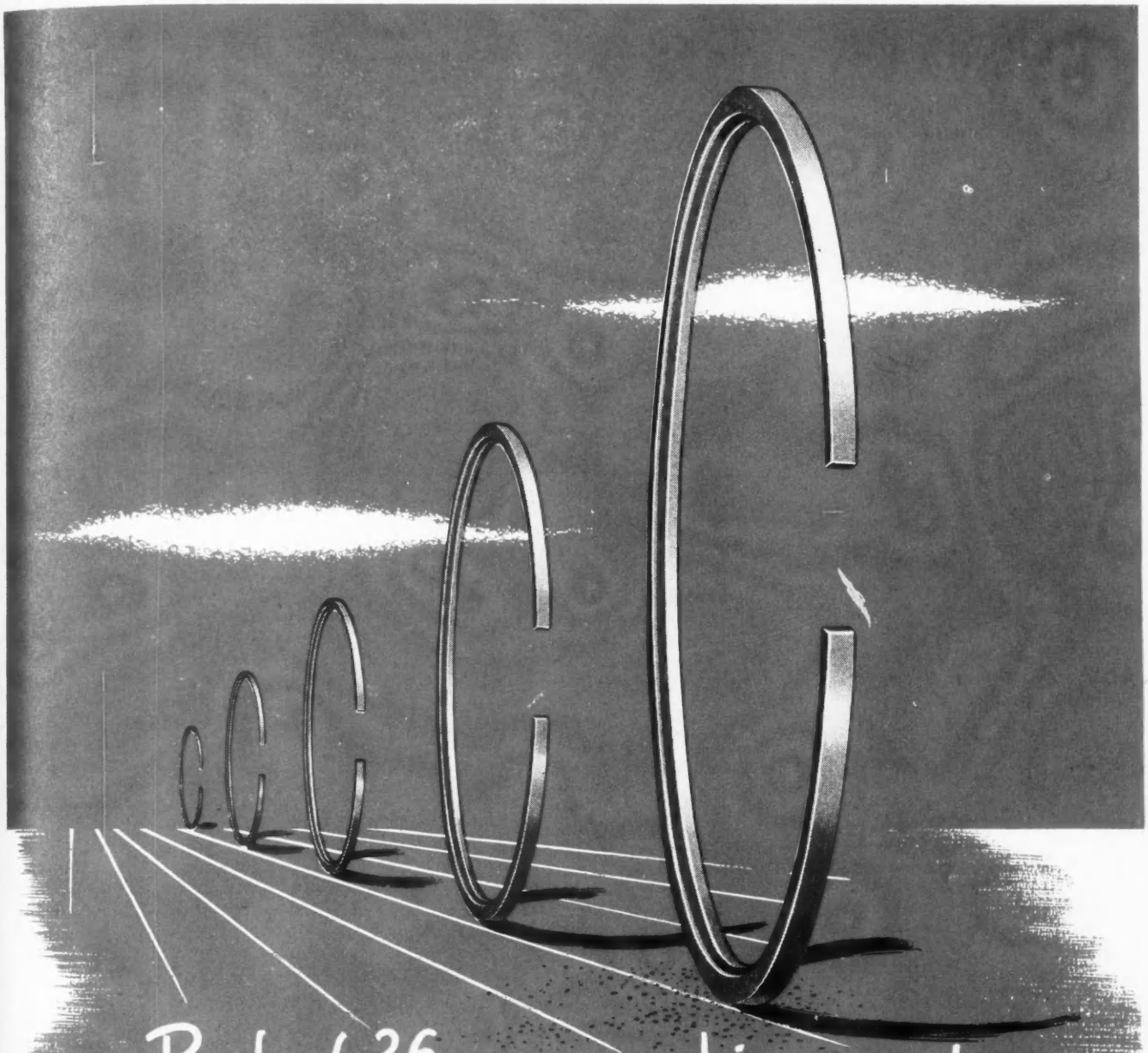
C-43—Two New Baldwin Products

The testing equipment division of the Baldwin Locomotive Works, Philadelphia, Pa., has available a creep testing machine for testing of metals at elevated temperatures to determine creep rate. The machine is of the lever arm type, of welded steel construction. Capacity: 12,000 lb (60,000 psi on 0.505 in. diam. specimen). Accuracy is within 1 per cent of load (A.S.T.M. specifications).

Strain indication is by extensometer attached at pin holes at shoulders of the specimen and is read directly to 0.000025 in. on a motor-driven revolution counter by means of a follow-up contact method. The extensometer will operate to rupture. The accuracy of the strain unit is within 0.00005 in., approximate.

The specimen is heated by a small furnace with coils wound with chromel wire arranged in three banks to provide temperature adjustment in top, middle and bottom zones by means of rheostats. Maximum temperature for furnace furnished as standard equipment is 1600F. Furnaces for 1800 and 2200F. can be supplied when desired. Maximum possible elongation of the specimen is 1¾ in. Another new Baldwin product is a Sonntag fatigue machine, the model SF-4, which is equipped for tension-compression testing both at

(*Turn to page* 88, *please*)



Peak of 36 years achievement

Today's Sealed Power staff, research facilities, and factories are at the peak of their 36-year progress. Since its beginning in 1911, Sealed Power has maintained leadership in the piston ring field. Automotive engineers have worked closely with us in finding the right answers to piston ring problems. This priceless experience is freely offered to you, to help make your good engines even better.

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SEALED POWER MOTOR PARTS

SEALED POWER PISTON RINGS

PISTONS • CYLINDER SLEEVES

PERSONALS

Recent Personnel Changes and Appointments at the Plants of Automotive and Aviation Manufacturers and Their Suppliers.

E. I. duPont deNemours and Co., Inc. —**George S. Demme,** Asst. Director of Sales will be in charge of nylon yarn sales and technical service, Nylon Div. **Frank H. Coker,** Asst. Director of Sales in charge of nylon yarn sales development and promotion, Nylon Div.

General Motors Corp., New Departure Div.—**Frederick G. Hughes,** retiring after 36 years with New Departure. He was Vice-President and General Manager of the Division.

Perfect Circle Corp.—**Harold Myers,** has joined central staff at Hagerstown, and will be associated with the Chief Engineer of the Manufacturing Div., **Will Cramer.**

Dearborn Motors Co.—**C. R. Powers** has been appointed procurement and engineering manager.

Stewart-Warner Corp. — **David C. Peterson,** Director of Engineering and Research.

Brunner Manufacturing Co.—**A. G. Zumbrun,** Chairman of the Board of Directors and Managing Director, succeeding **G. L. Brunner, Sr.,** retired. **G. L. Brunner, Jr.,** President and **Alfred D. Sullivan,** Chief Engineer.

Detroit Bearing & Bushing Co.— **C. C. Joslyn,** National Sales Manager.

The Electric Auto-Lite Co., Spark Plug Div.—**Robert Twells,** Plant Manager, has been elected President of The Institute of Ceramic Engineers.

United States Steel Corp.—**J. Lester Perry,** elected President of Columbia Steel Company, U. S. Steel subsidiary.

The Euclid Road Machinery Co.— **V. L. Snow,** Manager of newly established Sales Development Dept.

United States Rubber Co.—**Richard P. Harris,** Factory Manager at Detroit.

Seiberling Rubber Co.—**L. M. Seiberling, Sales Manager,** has been elected a Director, succeeding his father, the late **C. W. Seiberling.**

R. D. Wood Co., Hydraulic Machinery Div.—**Samuel R. Rhoads,** Manager.

The Taft-Peirce Mfg. Co.—**Edward B. Capron,** New York Sales Manager, has resigned to become a manufacturer's agent.

The Kellex Corp., Subsidiary of The M. W. Kellogg Co.—**M. W. Kellogg,** elected to the newly created post of Chairman of the Board.

Superior Coach Corp. — **Charles D. Blauvelt,** Export Manager.

The Weatherhead Co. — **Gene P. Rogers,** Sales Manager, Replacement Parts Div.

The Willard Storage Battery Co.— **Frank R. Somers,** Director of Merchandising.

Ford Motor Co.—**Richard E. Roberts,** Director of Community Relations Dept. **R. H. McCarroll,** Director of Chemical and Metallurgical Engineering and Research, elected a director of American Foundrymen's Association. **W. E. Kimbrough,** Manager, Truck Section, Truck and Fleet Sales Dept. **Gordon C. Eldredge,** Asst. to **B. R. Donaldson,** Director of Advertising, to supervise Ford car advertising.

Chrysler Corp.—**George W. Troost,** Comptroller, succeeding **L. A. Moehring,** recently deceased. Retirement of **Oliver H. Clark,** Executive Engineer for 38 years, has been announced.

Hudson Motor Car Co.—**G. A. Wilkinson,** Export Regional Service Supervisor, **Joseph H. Porter, Jr.,** Manager of Business Management Dept.

Oldsmobile Div., General Motors Corp.—**Harry R. Eckblade,** Asst. General Service Manager.

Reo Motors, Inc.—**Joseph Newman** appointed Comptroller, succeeding A. R. Kenny, recently deceased.

Nash Motors Div., Nash-Kelvinator Corp.—**Eugene L. Mench,** in charge of Truck Engineering.

Graham-Paige Motors Corp., Frazer Farm Equipment Corp. Div.—**D. M. Coons,** Manager, Parts and Service Div.

The Autocar Co., Autocar Sales & Service Co. (Subsidiary)—**Frank D. Wait,** Vice-President, resigned. **J. B. Rosenquest** elected a Vice-President to succeed Mr. Wait. **Alexander H. Bishop,** Vice-President, who resigned and is succeeded by Burt F. Dunham.

Consolidated-Vultee Aircraft Corp.— **Robert L. Mussen,** Manager of San Diego Div. **Mark R. Miller** appointed Commercial Sales Manager. **Charles M. Cook** appointed Domestic and Foreign Commercial Sales Staff representative in Washington.

Douglas Aircraft Co.—**Neil Petree, Frederick E. Hines** and **Edward H. McLaughlin,** elected Directors, succeeding **M. B. Rapp, Dr. R. D. Robinson and Harry Elliott,** resigned.

Fairchild Engine and Airplane Corp. —**Charles W. Deeds,** elected to Board of Directors.

Dana Corp., Spicer Manufacturing Div.—**S. F. Dupree, Jr.,** Manager of Services Parts Dept.

Borg-Warner Corp.—**George P. F. Smith,** elected a Vice-President. He is also President of the Marbon Corp., a Borg-Warner subsidiary.

Hydro-Lectric System

(*Continued from page* 26)

fluid under pressure to the bottom of the cylinder, and allowing fluid above the piston to return to the reservoir. For lowering, the knob is pushed in and valve porting is uncovered to permit pressure above the piston and a return flow from the lower end. The automatic regulator valve for the top cylinder is also located in the pump and operates in a manner similar to that described above.

Pressure sealing, using the pressure of the fluid to maintain zero clearance at the rotors under all conditions or temperature of wear, is used in the Gerotor pump and cylinder. The rotor pump body as well as the control valve for top operation are aluminum die castings; and the solenoid end fitting in the single-acting cylinders is a zinc die casting. The two upper sections of the control valve are plastic moldings. The cylinder solenoid, shown in Fig. 5, consists of a winding around the zinc die-cast fitting at the lower end and surrounding two inner steel core members. The upper one of these is pinned to the shaft and is relatively fixed; the lower end is spring loaded and constantly closes off the fluid port to the lower end of the fitting by means of the heavy rubber seal. Spring pressure is sufficient to prevent the entry of fluid even with the pump in operation unless the seal is lifted.

For the production of the Hydro-Lectric power systems, Dura has developed a separate department utilizing straight-line assembly and various power-driven conveyors. This new department is shown in Figs. 6 and 7.

Germany's First Luxury Car Since the War

American Military Government officials recently tested the Opel Kapitaen, the first luxury automobile to be made in Germany since the war. A six cylinder, four door sedan, the Kapitaen was produced at the General Motors Opel plant at Ruesselsheim and its expected price is $700 at the pegged exchange rate, about $2100 in comparable mark purchasing power.

• BUILT BY PETERBILT MOTORS CO.

Pulling Power

With the help of SKF Bearings!

Rugged, smooth-performing bearings are on vital rotating parts of this Peterbilt Truck used by the Macco Construction Company in the enlargement of Mills Field, San Francisco. Naturally, they're SKF—bearings that can stand the gaff when it comes to pulling a dump trailer loaded with 35 cubic yards of fill-in on trip after trip, day after day. With SKF Bearings come correct alignment, dependability, long life and low maintenance costs. That's why they're so popular with truck manufacturers everywhere. 6248

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Crankcase Oils Defined

Definitions of crankcase oil types and approved nomenclature have been established by the American Petroleum Institute and will be included in the 1947 Society of Automotive Engineers Handbook for three types of engine oils: Regular Type, Premium Type, and Heavy-Duty Type. The Lubrication Committee of the API arrived at the definitions which were circulated by the SAE Fuels and Lubricants Committee to the petroleum trade; reactions were evaluated, and the API Board of Directors approved them early this year. Oils are classified in terms of other than viscosity, consideration being given to other lubricating qualities. Transmission and axle lubricants are in the process of being similarly classified.

Bell XS-2, New Supersonic Research Plane, for AAF

The XS-2, a supersonic research plane, is being built for the Army Air Forces by the Bell Aircraft Corp. at Buffalo. Rocket powered, the XS-2 has a stainless steel body and a swept-back wing, unlike the conventionally winged XS-1, also built by Bell for the AAF.

New Model Rototiller

A new free wheeling model of the Rototiller is being produced at Willow Run by the Graham-Paige Motors Corp. A free-wheeling hub clutch has been added in the new model for handling ease, making it possible for the operator to free either wheel by pressing a handle-bar control. Since April 1, 1946, when assembly line production of the Rototiller started, to April 1, 1947, more than 30,000 units worth $15,750,000 retail have been shipped.

DOLE Thermostats
IN A RANGE OF TYPES FOR EVERY CAR

In cars of advanced design—it is certain that positive motor temperature control will continue to be a highly important factor in achieving top-flight performance. Controlled cooling is the prime function of DOLE Thermostats...They provide quicker warm-up—plus substantial savings in gas, oil and motor wear.

THE DOLE VALVE COMPANY
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CALENDAR

Conventions and Meetings

Soc. of Experimental Stress Analysis Annual Mtg., Chicago.....May 15-17
Nat'l Assoc. of Motor Bus Operators Annual Mtg., Chicago.....May 21-22
Amer. Soc. of Mechanical Engineers—Oil & Gas Power Nat'l Conference—Cleveland .....May 21-24
Amer. Iron & Steel Inst., New York City, May 21-22
Auto. Engine Rebuilders Assoc. Convention, Detroit .....May 22-24
Mid-America Exposition, Cleveland—May 22-31
Amer. Soc. of Mechanical Engineers—Aviation Mtg., Los Angeles..May 26-29
Inst. of the Aeronautical Sciences Personal Aircraft Mtg., Detroit..May 26-27
Metal Powder Assoc., Spring Mtg., New York .....May 27
Soc. of Automotive Engineers—Summer Mtg. French Lick Springs, Ind. June 1-6
The National Federation of Sales Executives, Los Angeles .....June 2-4
Amer. Soc. of Mechanical Engineers—Semi-Annual Mtg., Chicago..June 16-19
Amer. Soc. of Testing Materials—Annual Mtg., Atlantic City.....June 16-20
Amer. Soc. of Mechanical Engineers—Applied Mechanics Div., Schenectady .....June 23-25
American Electroplating Society, Detroit .....June 23-27
Institute of the Aeronautical Sciences, Annual Summer Mtg., Los Angeles, Aug. 7-8
Soc. of Automotive Engineers—West Coast Transportation & Maintenance Mtg., Los Angeles.....Aug. 21-23
Amer. Soc. of Mechanical Engineers—Fall Mtg., Salt Lake City.....Sept. 1-4
Amer. Soc. of Mechanical Engineers—Ind. Instruments & Regulators Div., Chicago .....Sept. 8-9
Instrument Society of America Conference, Chicago .....Sept. 8-12
Society of Automotive Engineers—Tractor Mtg., Milwaukee....Sept. 17-18
Natl. Machine Tool Builders Assoc. Machine Tool Show, Chicago, Sept. 17-26
Soc. Automotive Engineers, Aeronautic Mtg., Los Angeles .....Oct. 2-4
Amer. Soc. of Mechanical Engineers, Petroleum Mech. Eng. Conf., Houston, Tex. .....Oct. 6-8
Natl. Conference of Industrial Hydraulics, Chicago .....Oct. 16-17
Soc. of Automotive Engineers, Production, Cleveland .....Oct. 20-21
Amer. Soc. Tool Engineers—Semi-Annual Mtg., Boston.....Oct. 30-Nov. 1
Natl. Aircraft Show, Chicago.....Nov. 1-9
Amer. Society of Body Engineers, Annual Tech. Convention, Detroit, Nov. 5-7
Amer. Soc. of Mechanical Engineers, Annual Mtg., Atlantic City.....Dec. 1-5
Automotive Service Industries Show, Chicago .....Dec. 8-13

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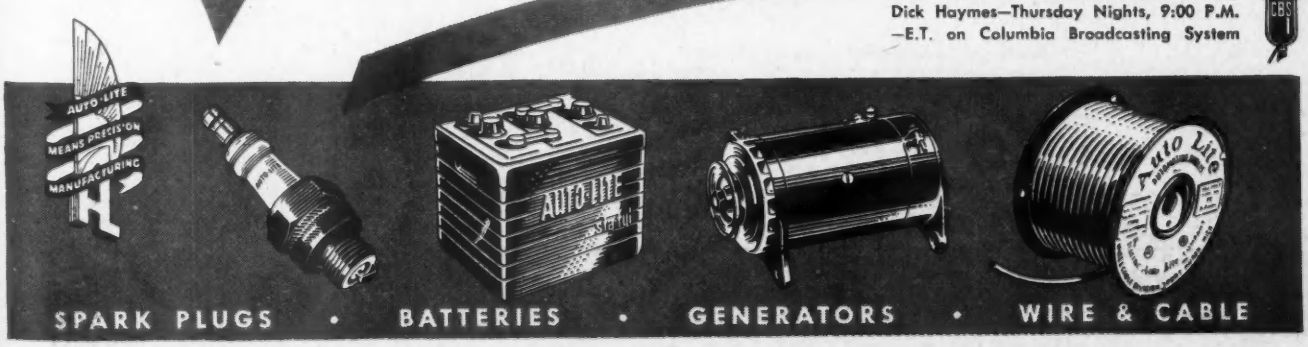

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ELECTRO-ALLOYS DIVISION
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Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE *and* AVIATION INDUSTRIES

Renewed advances in general business activity are indicated. The *New York Times* index for the week ended April 19 stands at 144.2, as against 139.5 for the preceding week and 125.9 a year ago.

Sales of department stores during the week ended April 26, as reported by the Federal Reserve Board, equaled 265 per cent of the 1935-39 average, as compared with 271 per cent in the week before. Sales were 14 per cent above the corresponding distribution a year earlier, as against a preceding decline of 6 per cent. The total in 1947 so far reported is 10 per cent greater than the comparable sum in 1946.

Electric power production increased slightly in the week ended April 26. The output was 17.4 per cent above the corresponding amount in 1946, as compared with a like advance of 16.9 per cent shown for the preceding week.

Railway freight loadings during the same period totaled 893,776 cars, 3.2 per cent more than the figure for the week before and 35.4 per cent above the corresponding number recorded last year.

Crude oil production in the week ended April 26 averaged 4,929,900 bbl daily, 17,800 bbl more than the preceding average and 257,850 bbl above the comparable output in 1946.

Production of bituminous coal and lignite during the week ended April 19 is estimated at 12,600,000 net tons, 77 per cent more than the output in the week before. The total production in 1947 so far reported is 14.1 per cent above the corresponding quantity in 1946.

Civil engineering construction volume reported for the week ended May 1, according to *Engineering News-Record,* is $102,480,000, or 16 per cent more than the preceding weekly figure but 6 per cent below the comparable sum in 1946. The total recorded for 18 weeks of this year is 7 per cent more than the corresponding amount in 1946. The increase in public construction is 23 per cent, but private construction is 0.8 per cent below that a year ago.

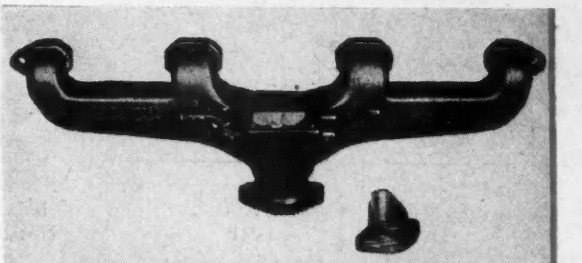
The wholesale price index of the Bureau of Labor Statistics for the week ended April 26 is 146.8 per cent of the 1926 average, as compared with 147.2 for the preceding week and 109.6 a year earlier.

Member bank reserve balances increased $6 million during the week ended April 30. Underlying changes thus reflected include a decline of $25 million in Reserve bank credit and a rise of $137 million in Treasury deposits with Federal reserve banks, accompanied by an increase of $13 million in money in circulation.

Total loans and investments of reporting member banks declined $100 million during the week ended April 23. A decrease of $110 million in commercial, industrial and agricultural loans was recorded. The sum of these business loans, $10,967 million, shows a net increase of $3,499 million in 12 months.

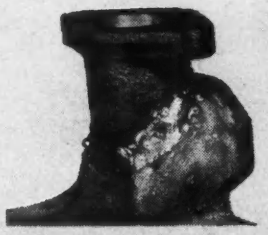
What... Remodel Iron Parts Already Cast?

Yes, right on the production line ...with NI-ROD



BEFORE: Here's the original cast iron manifold and the extra port. After inspection of both parts, the manifold was preheated to 450°F.

AFTER: Using a jig, the port was mounted at a 3½° angle and "spotted" in 3 places. A continuous weld then completed the job.



CLOSE-UP: A post heat to 450°F., slag removal and air cooling preceded the final step . . . boring of the port. Result: *another success story for Ni-Rod.*

Here's an interesting Ni-Rod case history . . .*

It shows how easily Ni-Rod can simplify design changes and speed production.

Grey iron manifolds like the one at the top became outmoded when an additional port was required.

But, quickly and easily, Candler-Hill Corporation, of Detroit, remodeled the manifolds on hand, using Ni-Rod.

Saving time, money and labor . . . this company cut a correctly located hole in each casting, then welded on a secondary port using an a.c. transformer-type welder drawing 160 amperes.

Since other rods gave less favorable results, Candler-Hill was particularly gratified with Ni-Rod. It speeded-up the process, required less preheat and post heat, and the machinability of the weld allowed quick boring of the port. Position of ports was held within ± ½°, and all other dimensions were held within ± .003".

Try a 5-lb. package of Ni-Rod. Use it on a.c. or d.c., and see how easy it is to get strong, sound, machinable welds in cast iron.

*Reg. U. S. Pat. Off.

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Air Briefs

(*Continued from page* 50)

craft Corp., Westinghouse Electric Corp. and Wright Aeronautical Corp. Informed observers believe that the most immediate promise is the utilization of nuclear fission to provide heat for operating a gas turbine. All of the above contractors are active in the aircraft gas turbine field. Fairchild Engine and Airplane Corp. is coordinating the program with the assistance of a large number of consultants.

Unusual Machining Flexibility

(*Continued from page* 39)

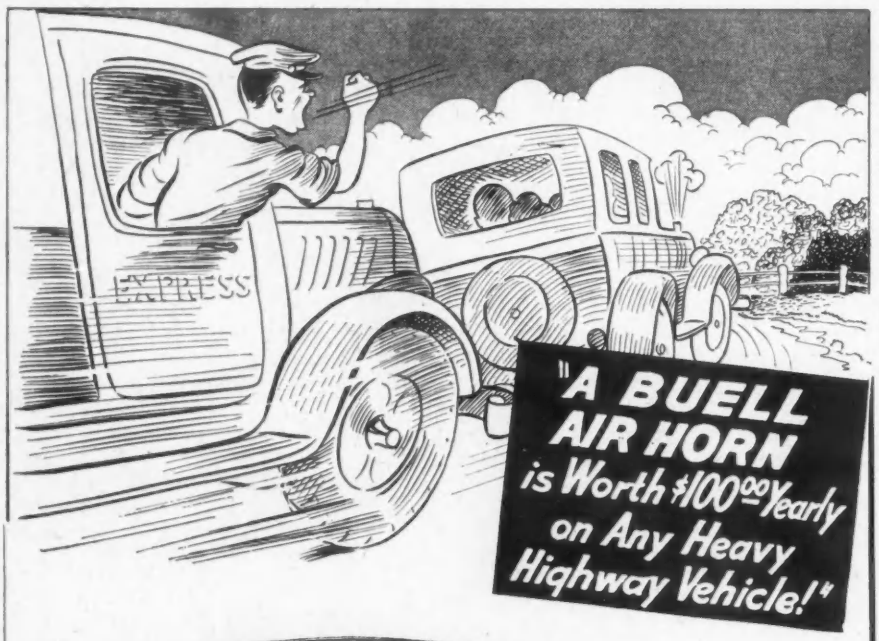
So far as machine design is concerned, the combination of operations has been carried out to the fullest extent. For example, with the enormous duplex Fitchburg mill for milling the ends of blocks, the fixture is designed to hold two blocks and four heads, two heads on each side. The heads go through twice to complete the milling of top and bottom surfaces. For each cycle of the mill they get one complete block and two heads. One of the largest of the Fitchburgs is used for milling the top and bottom surfaces of the block in a single pass. It has five heads, as illustrated, one head having two different cutters. One of the cutters is installed in an angular position to mill an inclined pad. The rough-milling cutters are all fitted with individual blades tipped with a special grade of Haynes-Stellite, while finishing cutters are tipped with cemented-carbide.

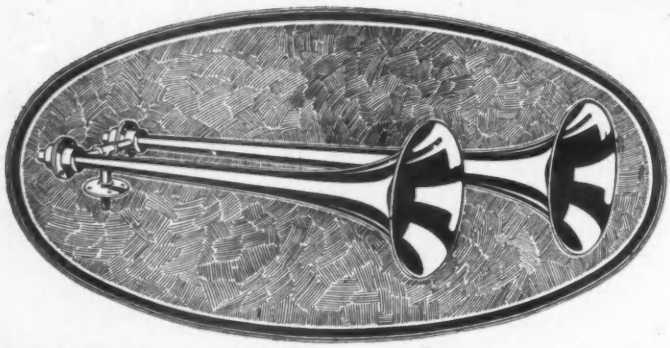
Even though this layout is conducive to maximum economy and amortization of equipment and tooling, the production department has taken another step forward to assure flexibility. For each machine the spindle heads are mounted on a separate spacer block which is readily removable and replaceable whenever a change in centers is desired. This "unfreezes" engine design and leaves the engineering department free to make even major changes in design later on without fear of scrapping expensive equipment.

Upon completion of milling operations the blocks are moved over to the adjacent machine line which consists of multiple-spindle and way-type Natco drilling and tapping machines. An eight-spindle Moline handles cylinder boring. Through proper coordination, all of the machines in this group have a fixture height of 34 in., and are all connected by a Logan gravity roller conveyor system with built-in roll-over fixtures and turntable fixtures.

The equipment is arranged for drilling or tapping of the maximum number of holes required for an eight-cylinder block with fixtures designed to hold the large block, and with provision for adjustment for clamping smaller blocks. Because of the symmetry of design, only a minimum of changeover is necessary to convert a drilling or tapping machine from one block to another. In fact, what is actually done is to fit drills or taps in the right location and in the proper number, no change being necessary in the spindle heads themselves.

The Moline cylinder boring machine holds eight vertical boring bars, and it is only necessary to remove two, four or six bars to accommodate the scheduled block. The fixtures remain untouched save for adjustment of locating dowels. The massive boring bars are fitted with Davis tooling with multiple sets of cutters in order that the bore may be finished completely in one pass from the rough. On bores for wet liners, a feature of the Davis bar is a separate tool for finishing the chamfer on the upper edge of the lower pilot surface. As the spindle completes its stroke, the tools are fed out and rotated to chamfer. Another noteworthy feature of the Moline is the Timken Bearing piloting of the boring bars in a fixture in the base to asure perfect alignment of bores.





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- *Installed as original equipment on many Trucks and Buses.*
- *They reduce maintenance costs by decreasing stops, starts and slowdowns.*
- *All records prove that they save tires, brakes, clutches and gears.*
- *Cut gas and oil consumption.*

With a Buell the driver has greater security, maintaining a steady cruising speed. Slowing a 20 ton load from 50 MPH to 30 MPH means destroying a lot of energy thru brake lining and tires. It is replaced by burning more gasoline, increasing load on engine and tires again, to regain speed. This all costs money. We believe a Buell Air Horn is worth $100.00 yearly on any heavy highway vehicle. Then remember a Buell will last more than 10 years. How would you rate a $100.00 investment that earned $100.00 yearly for 10 years. Ask the man who has a Buell.

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In a single composite strip, you get the solid, dense metal you choose on *one side or both sides* of the steel base . . . in controlled thickness, inseparably bonded, retaining its relative proportions in all gauges.

SuVeneer Clad Metal can be drawn, formed or stamped by your customary processes. It is a material well worth the immediate attention of modern metal fabricators in every field. Your detailed inquiries are welcome!

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AGE RESISTANCE

RESILIENT parts made from HYCAR American rubber resist the aging effects of air, sunlight, ozone, heat, cold, and all other types of oxidation. That's why they *stay* resilient—and stay on the job for a long, long time.

Other important properties of HYCAR American rubber are shown in the box at the right. And it's important to know that these properties may be had in an almost limitless number of combinations—each compounded to meet a given set of service conditions.

We make no finished products of HYCAR. But we urge you to ask your supplier for parts made from this versatile material. You'll learn for yourself that it's wise to use HYCAR—in difficult or routine applications—for long-time, dependable performance. For more information, please write Dept. HD-5, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

CHECK THESE SUPERIOR FEATURES OF HYCAR

1. *EXTREME OIL RESISTANCE — insuring dimensional stability of parts.*
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Hycar

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B. F. Goodrich Chemical Company

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GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals

PUBLICATIONS

(*Continued from page* 52)

A-127—Specifications for Fan Belts & Radiator Hose

The B. F. Goodrich Co.—A 42-page booklet giving specifications for fan belts and radiator hose and describing features of construction has been issued by the company. Specifications for belts and radiator hose include those for passenger cars, trucks, buses and tractors. The makes and years of all vehicles are listed together with belt numbers used and the size of upper and lower hose for the radiation systems.

A-128—Enclosed Motors

Wagner Electric Corp.—8-page Bulletin MU-25A, describes the advantages of totally-enclosed motors, both fan-cooled and non-ventilated type. The bulletin is fully illustrated.

A-129—Pressure and Temperature Gages

Kollsman Instrument Div., Square D Co.—8-page folder on the new Kollsman line of aircraft pressure and temperature gages, including free air thermometers, fuel pressure gages, oil pressure gages, landing gear oil pressure gages, engine thermometers, etc. The units are described and information is given on available ranges and mounting requirements.

A-130—Cleaning Compound

Turco Products, Inc.—An illustrated bulletin describing Mulsirex, a new emulsifying type cleaning compound, to be used with kerosene and other petroleum cleaning products to provide greater safety, efficiency in removing heavy deposits of oil and light grease from all types of equipment.

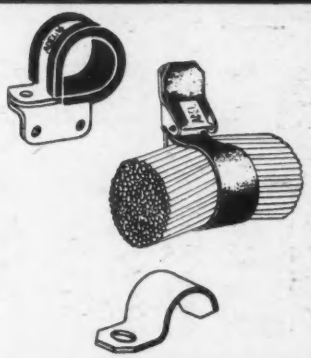
A-131—Aluminum Castings

The National Bronze and Aluminum Foundry Co.—A new 4-page folder describing and illustrating the uses of aluminum castings for various products. It also describes the company's facilities for handling large volumes of these castings.

A-132—Industrial Control Devices

The Brown Instrument Div. of Minneapolis-Honeywell Regulator Co.—Catalog 8302 contains useful information on electric and pneumatic automatic control systems. Schematic diagrams, dimensional drawings and photographs of the instruments, as well as specifications, range charts, etc., are included.

ADEL LINE SUPPORT CLIPS

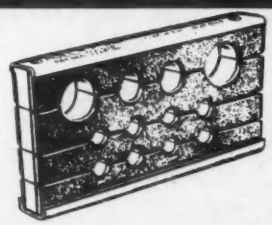


ADEL Clips provide a simple, rugged, low cost support for tubing, piping and electrical cables. Manufactured in over 13,000 different types and sizes. Over 330 million now giving dependable support in aircraft, marine and industrial installations.

ADEL Shock Absorbing Clips give cushioned support—insulate lines from vibration and wear.

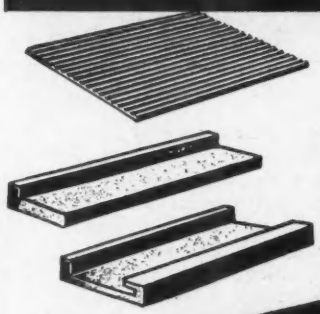
ADEL Cable Harness Straps are self-adjusting supports accommodating single cables or any combination of wires. Positive locking device permits easy repair or replacement of wires. Loads to 2800 lbs.

ADEL LINE SUPPORT BLOCKS



A low cost, easily installed support for multiple grouping of lines. Provides rugged, resilient support eliminating line failures and fitting leakage caused by vibration. Available with hard maple, phenolic or **ADELITE** blocks in wide variety of sizes for accommodating 1 to 30 lines, ⅛" to 2½" in diameter.

ADELITE SYNTHETIC RUBBER



ADELITE—a tough, wear-resistant compound 26 to 33% lighter than conventional synthetic rubber. Impervious to aromatic vapors and liquids. Extremely low compression set. Permanent resiliency. Excellent sound insulating characteristics. Any hardness from 30 to 80 Shore Durometer. Available in wide variety patterns including channels, gaskets, pads, floor coverings and other molded forms.

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General News

(*Continued from page* 23)

drives. General Manager of the Valve Div. will be H. I. Dyer, former plant manager of the Battle Creek and Lawton plants. General Manager of the Saginaw Div. will be Herbert Russell, former plant manager of the Saginaw plants. F. H. Mott, Jr., formerly in charge of sales and engineering for the Rotor Bumper Dept. of Wilcox-Rich has been named general manager of the Bumper Div. R. H. Daisley, previously general manager of Wilcox-Rich has been made director of manufacturing for the company.

American Foundrymen Meet

Attracted by the 51st Annual Convention of the American Foundrymen's Association held in Detroit in April 1947 great throngs of foundry specialists, metallurgists, and equipment suppliers, crowded the technical sessions held at the Book-Cadillac and Statler Hotels for four days, the opening sessions being held at the Rackham building.

An inspirational talk on the importance of the foundry industry in all phases of our economy and in particular to the automotive industry given by George T. Christopher, president of Packard Motor Car Co., was the keynote of the meeting. He mentioned that the average motor car contains 614 lb of gray iron and 76 lb of malleable iron castings. Translated into a yearly production of 5 million cars, this adds up to an impressive tonnage of basic materials for one industry alone.

Those attending the convention had an opportunity to visit many foundries in the Detroit area currently in the course of completing major modernization programs. Among these was the Cadillac Motor Car Div., foundry whose newly created facilities were previewed by the technical press just a few days before the meeting opened and the great Ford foundries which are in the process of completing a $12-million expansion program. The aspects of worker comfort and mechanization featured in these projects were among the points made by Mr. Christopher in his talk.

Although by far the majority of the technical papers presented at the meeting dealt with research and foundry practice of interest primarily to the specialist and metallurgist, considerable attention was given to operational costs. This is to be expected considering that costs constitute the major problem facing all industry. From a management viewpoint, costs are important not only from the narrow aspect of accounting practice but in the mechanization and planning and modernization designed to hold cost levels despite the rising tide of labor and materials. To this end there were interesting papers on materials handling, plant equipment, patterns, and advanced techniques.

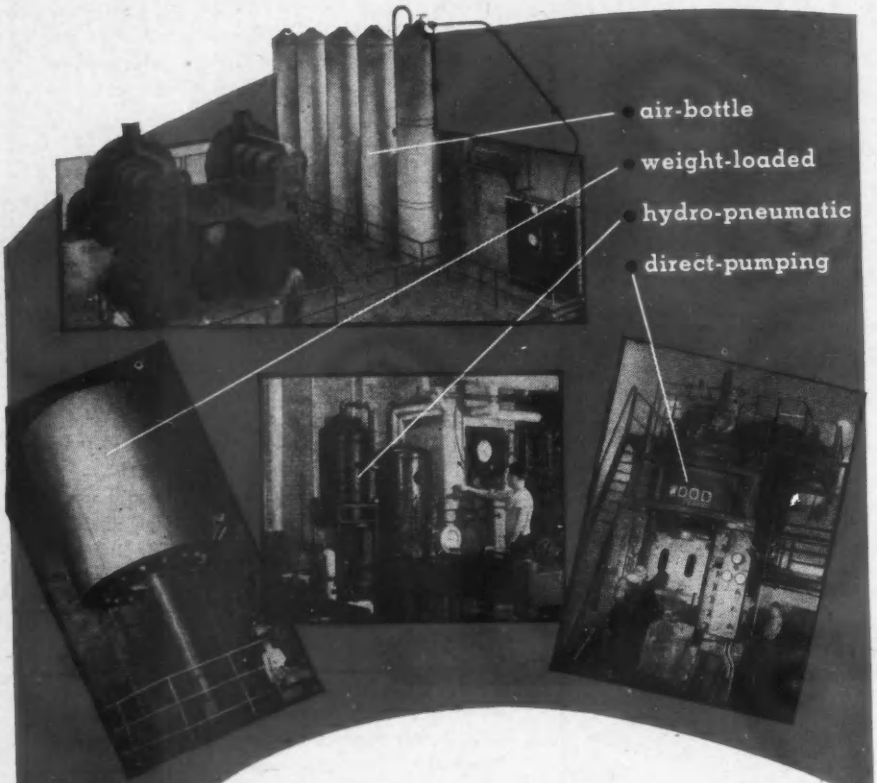
Allied with cost is the basic problem of good quality. This includes procedures designed to assure consumer acceptance as well as the reduction of scrap and rejects. Wider application of radiography, Magnaflux inspection, and other forms of inspection were described by some of the specialists.

The horizon of the foundry industry has been greatly increased by its current activities—gray iron, steel, mallable iron, aluminum and magnesium, brass and bronzes—and the sessions were so designed as to cover each of these interests in comprehensive fashion.

Although space does not permit the mention of specific papers, one of the most significant was a lecture on the simplification of light metal casting design by W. T. Bean, Jr., Continental Aviation & Engineering Corp. The author has gained an enviable reputation in the

(*Turn to page* 70, *please*)

which hydraulic power system is best for you?



There is no one best hydraulic power system for all applications. But whatever your requirements, you can be sure of getting unbiased recommendations regarding them from Wood engineers, regardless of the size or service of the presses you operate, whether it be one or a hundred. This, because R. D. Wood designs and builds not only pressure-storing accumulator systems, but also furnishes all types of direct-pumping units. In each case our engineers recommend the type of equipment best suited to your individual needs, rather than endeavor to sell you some particular type of system. Their experience can prove highly valuable to you. Prompt attention is given all inquiries. R. D. Wood Company, Public Ledger Bldg., Philadelphia 5, Pa.

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field of experimental stress analysis and has developed techniques of great value to research engineers of the motor industry. His work has demonstrated that with proper design—simplified design—one can produce lighter parts capable of carrying greater loads and having much greater endurance.

Gar Wood Moves

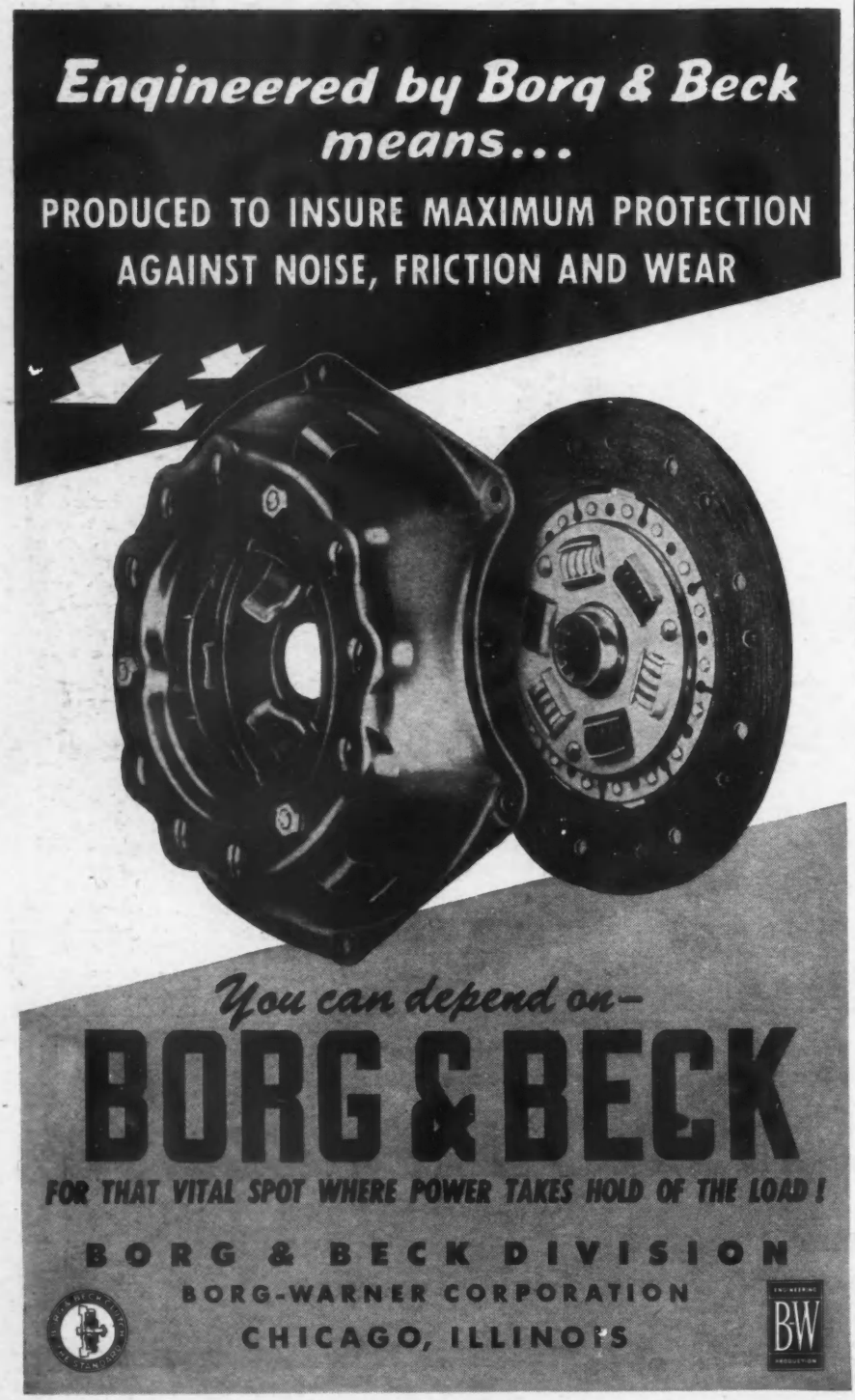
Gar Wood Industries have moved its offices to Wayne, Mich., where it will occupy the Bendix plant used by Bendix Aviation Corp. during the war for building landing gear.

Firestone in Australia

Firestone Tire and Rubber Co. is establishing a new tire manufacturing plant in Adelaide, South Australia. The eleventh plant to be built by Firestone in foreign countries, the Australian operations will be supervised by Horace G. Miller, managing director of the Firestone New Zealand Co.

Chrysler Gets Patents For Multiple Engine

Chrysler Corp. has acquired patents held by H. T. Wilson and M. L. Carpentier, Detroit inventors, for their invention to make one big engine out of five smaller ones. The invention is intended primarily to supply large horsepower units in an emergency faster than the industry could tool up to produce them.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FOR THAT VITAL SPOT WHERE POWER TAKES HOLD OF THE LOAD!
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CHICAGO, ILLINOIS
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Lower Cost Electroplating Developed by Westinghouse

A new electroplating process, developed by the Westinghouse Electric Corp., is said to reduce finishing costs 20 per cent or more while still giving a finish equal to that produced by older methods. In this new process current is reversed periodically to remove surplus metal, to level peaks and to polish. Successive layers of plating can be built up to almost any desired thickness, it is claimed, and thus make a more dense and homogeneous deposit than that possible with the older continuous current process.

Bendix-Westinghouse Produce Air Brake Movie

A 25 minute sound film subject entitled, "Air Brakes, Operation and Maintenance," spearheads a broad educational program inaugurated by the Bendix-Westinghouse Automotive Air Brake Co. of Elyria, O. This 16mm motion picture emphasizes the recognized simplicity of the air brake system, its operation and maintenance, and is available for meetings through all authorized Bendix-Westinghouse regional offices and distributors.

Borg-Warner to Build New Plant at Memphis

Borg-Warner Corp. is planning to build a $2.5 million plant at Memphis, Tenn., for manufacture of universal joints for the automotive industry. A one-story plant to cost approximately $500,000 will contain 160,000 sq ft of floor space. Estimated cost of manufacturing equipment will be about $2 million.

Jamestown Metal Builds

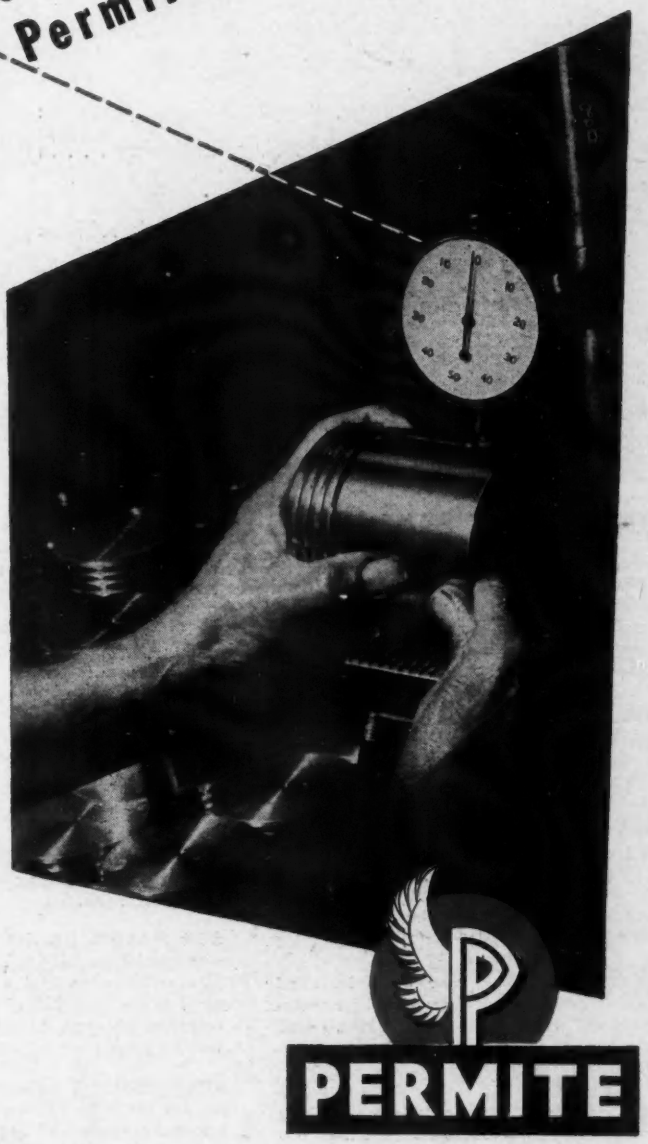
The Jamestown Metal Equipment Co. of Jamestown, N. Y., will immediately begin constructing a $200,000 addition to its plant for the manufacture of automotive heaters and regulators. To be completed by September, the new structure will have 50,000 sq ft of floor space.

K. T. Keller Recovering

K. T. Keller, president of Chrysler Corp., is recovering from an operation at the Mayo Clinic at Rochester, Minn. Authorities at the clinic said Mr. Keller's condition following the operation was satisfactory.

On the Nose!

It'll be there every time when the castings are Permite Aluminum



YOU machine the full run of a part without tool resetting — in less time, at lower cost — when the castings are Permite Permanent Mold Aluminum Castings.

You remove a uniform amount from each casting . . . from the first and the thousandth, alike. After your standard machining operation, the gage reads "right on the nose", well within the tolerance every time.

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Perhaps you too can enjoy the cost-saving superiorities of Permite Permanent Mold Aluminum Castings in your production. Submit your parts problem to us.

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Proof of the value of any industrial product lies in the experience that practical men have had with it. Sun products have been "Job Proved" in the lubrication of almost every type of mining, manufacturing, power and transportation equipment . . . in refrigeration and air-conditioning . . . in metal cutting, tempering and quenching . . . in the processing of textile fibers, leather, natural and synthetic rubbers . . . in the impregnation of electrical, electronic, and packaging materials of various kinds.

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SUN INDUSTRIAL OILS

SOLNUS OILS — Well-refined straight mineral oils. Stand up under hard use for long periods of time. Recommended for use in the machine tool industry, in air compressors, certain types of Diesels, etc.

SUNVIS OILS — Are in the same category as Solnus Oils with the difference that, in addition, they meet practically all paraffinic and high V.I. oil specifications.

OCNUS OILS — Low carbon-content oils, containing an additive which minimizes oxidation and gives detergency. Ideal lubricants for internal combustion engines subjected to continuous heavy loads under the most adverse operating conditions.

DYNAVIS OILS — Low pour point inhibited oils which help prevent formation of harmful corrosive and sludge-forming acids. Well-suited for engines fitted with alloy bearings and operated at high temperatures.

SUNTAC OILS — 100% petroleum products which have been treated to increase their adhesiveness. Recommended for general lubrication in all industries where sudden shocks and reversal of loads take place. These oils cling to the parts to be lubricated.

CIRCO OILS — Used for general lubrication of industrial machinery when straight mineral oils are required.

SUNISO REFRIGERATION OILS — Have extremely low pour points and long life stability characteristics. Initially neutral and resistant to formation of detrimental acids under service conditions. The most outstanding oils in the refrigerating and air-conditioning fields.

STEAM CYLINDER OILS — High flash and fire point lubricants for either saturated or superheated steam conditions and for worm gear speed reduction units.

SUN CAR JOURNAL OILS — Dark oils meeting A.A.R. Specifications. For use on railroad cars and waste-packed bearings of railroad equipment.

SUN DELAWARE OILS — Dark oils for general lubrication on older type industrial machinery.

SUNOCO WAY LUBRICANT — Has good metal-wetting and adhesive properties, ample viscosity and E.P. qualities. For use on tableways, as it eliminates chatter and scoring . . . resists corrosion.

SUN MARINE ENGINE OILS — Compounded with special emulsifying agents in order to provide adhesion to and lubrication of working parts in the presence of water. For the lubrication of bearings, eccentrics, cross-heads and various other parts of steam engines.

ROCK DRILL OIL — Heavy-duty adhesive type oil. For use in jack-hammers, stopers and drifters on heavy-duty mining operations.

SUNVIS 900 SERIES TURBINE OILS — High V.I., predominantly paraffinic oils, of uniform 0°F. pour points, containing additives to give high oxidation stability and corrosion resistance under practical operating conditions. Modern oils for turbine and hydraulic systems.

SUN INDUSTRIAL GREASES

SUN CUP GREASES — Water resistant. For grease cup and grease gun application when the service is not severe.

SUN GUN GREASES — Smooth greases made with medium viscosity oil. Stable under pressure in power guns or booster guns.

ADHESIVE PRESSURE GREASES — Won't drip or splash and are excellent lubricants for open gear applications.

SUN DARK PRESSURE-SYSTEM GREASES — For power-driven central grease lubricating systems in heavy industries. Can also be used as a "medium cup grease."

SUN MINE CAR GREASES — Available in several grades. Suitable for both anti-friction bearings and plain bearing cavity-type wheels.

SUN ROLLER BEARING GREASES — For use on electric motors and generators and other high-temperature machinery equipped with ball or roller bearings.

SUN GEAR COMPOUNDS — Black adhesive open gear compounds and wire cable greases. Recommended for open gears on metalworking power presses, mining machinery, old reduction mills, crushers, pump gears, etc.

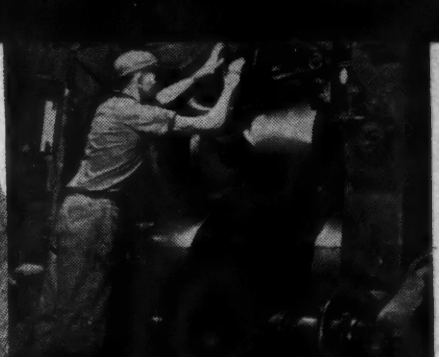
SUN MINING MACHINE LUBRICANT — Semi-fluid. For use where a light but adhesive type grease is required. Free from separation or decomposition.

SUNOCO TRACTOR ROLLER COMPOUND — For miscellaneous parts of caterpillar or crawler-type tracks. Provides good lubrication with exceptional sealing qualities.

SUN METALWORKING OILS

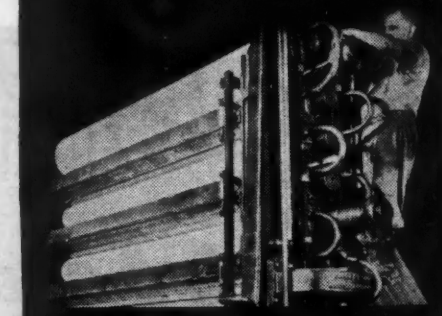
SUNICUT — Straight or non-emulsifiable transparent cutting oils. Recommended for automatic screw machines and for heavy-duty machining operations.

SUN INDUSTRIAL

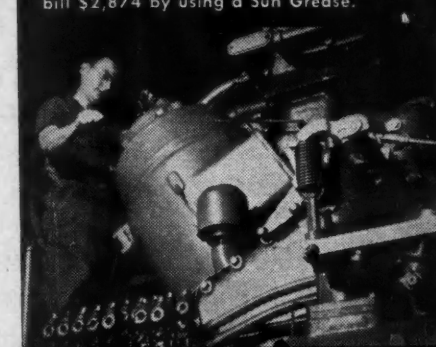


RUBBER MANUFACTURER saved $3,000 a year with a Sun Processing Aid.

ALUMINUM PARTS MANUFACTURER increased output 43% with Sun Cutting Oil.



PAPER MILL slashed annual lubrication bill $2,874 by using a Sun Grease.



POWER PLANT found Sun Diesel Lubricant lasted 50% longer.

A TEXTILE MILL increased slashing speed 60% by adopting a Sun Processing Oil.

SUNOCO EMULSIFYING CUTTING OIL—A self-emulsifying oil which produces a stable white emulsion when mixed with water. Sunoco is an efficient and economical cooling and lubricating medium for turning, milling, drilling, and other metalworking operations on both ferrous and non-ferrous metals. It is also an excellent grinding coolant.

SUN QUENCHING OILS—Specially refined oils designed to develop maximum physical properties in a wide variety of steels.

SUN TEMPERING OILS—Specially refined oils for tempering steel up to 550°F. Due to their low carbon content and stability under heat, these oils have an unusually long service life.

SUN ROLLING OILS—Straight and emulsifying oils which will permit maximum production in rolling steel, aluminum and brass.

SUN ANTI-RUST COMPOUNDS—Petroleum base oils with chemical additives designed to prevent the rusting and corrosion of steel.

SUN PROCESSING OILS

SUNOTEX TEXTILE OILS—Designed to impart certain additional properties to various forms of fibers during their processing from the fiber state into a manufactured product. All Sunotex textile oils are emulsifiable in water.

SUN COTTON CONDITIONING OILS—Pale mineral oils which condition the cotton. They prevent waste by cutting down excessive amounts of "fly" or fine air-borne particles of lint.

SUN ASBESTOS FIBER CONDITIONING OIL—Used for spraying on the asbestos during processing. Fibers are not so readily damaged or broken down into harmful dust when this product is used.

SUN CORDAGE OILS—Are adaptable in various formulae used by cordage manufacturers. They are selected products which are highly compatible with additives.

CIRCOSOL—2XH (Rubber Processing)—An elasticator and processing aid for GR-S particularly.

CIRCO LIGHT PROCESS OIL (Rubber Processing)—A processing aid and excellent softener for natural rubber, natural rubber reclaims, and neoprene synthetic rubber particularly. Used for GR-S to some extent.

SUNDEX 53 (Rubber Processing)—An inexpensive product suitable for processing GR-S and blends of GR-S and natural rubber. An established outstanding processing aid for footwear rubber stocks.

CIRCOMAR-5AA (Rubber Processing)—A black colored product used in reclaiming natural rubber scrap. Used also as substitute for asphalt fluxes in processing natural and GR-S rubber. Free-flowing at room temperature.

SUN LEATHER OILS—Mineral base leather oils. Used for obtaining the desired tensile strength, proper temper and a controlled moisture content. They maintain a light even color . . . mix well . . . distribute evenly.

SUN MISCELLANEOUS INDUSTRIAL PRODUCTS

SUN SPIRITS—For the thinning of paints, varnishes, and enamels. Also for metal cleaning. This product is a pure water-white petroleum solvent and is free of corrosive sulphur.

SUN WAXES—Used in packaging, sealing, coating, waterproofing and for numerous manufacturing and chemical processes.

PRODUCTS

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SCRUB... *the* AIR *in your plant* CLEAN

with Schmieg CENTRI MERGE *Automatic* DUST and FUME Eliminator

Dust and fumes don't get a chance to circulate in plants equipped with a Schmieg CENTRI-MERGE Eliminator. The moment dust or fumes develop from buffing, burring, grinding, polishing, curing or any other processing operation, they are swept up on an air stream that carries them back through ducts to a central Collection Unit. In the washing chamber of this Unit the CENTRI-MERGE high pressure centrifugal water action literally *scrubs* every last vestige of contamination from the air stream—cleans it so thoroughly that, in many cases, it can be recirculated back into the plant. That's why users are so enthusiastic about what CENTRI-MERGE accomplishes. Protects both workmen and work.

Consult Schmieg engineers regarding your problems of dust and fume control.

THE *best* AIR PURGE *is* CENTRI MERGE

Schmieg INDUSTRIES INC.
Engineers & Manufacturers

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Crosley Production

(*Continued from page* 32)

bearing caps. It is fitted with a large, massive, three-station indexing fixture, each station holding a set of five bearing caps. One station is used for loading and unloading. A large Conomatic is found here for the turning and cutting to length of cylinder barrels.

Outstanding touch of modernity is found in the application of the Pratt & Whitney Air-O-Limit gage for checking the large and small end bores of connecting rods. The small end is held to a total tolerance of 0.0003 in. while the big end is held to 0.0005 in. As illustrated, three of these gages are used at this station.

Marion Assembly Plant

The Crosley assembly plant in Marion, Ind., is a collection of factory buildings having a floor space area of 165,076 sq ft which will be augmented with a new addition of some 7200 sq ft. The facilities lend themselves admirably to the building of a small car and have been developed in keeping with the latest mass production methods. The entire plant is conveyorized with some 3000 ft of monorail conveyors and about 1200 ft of floor conveyors for the chassis and final assembly lines.

Let us consider first the body building. At the present time all of the body stampings are obtained from an outside source in nearby Indianapolis. Upon receipt from the supplier, the stampings are polished and prepared for sub-assembly. One corner of the body building is set apart for the making of sub-assemblies, featuring well designed steel framing fixtures for producing doors, underbodies, front sections, rear sections, etc. Each of the fixtures is served by one or more of the familiar Progressive portable gun welders with overhead mounted transformers.

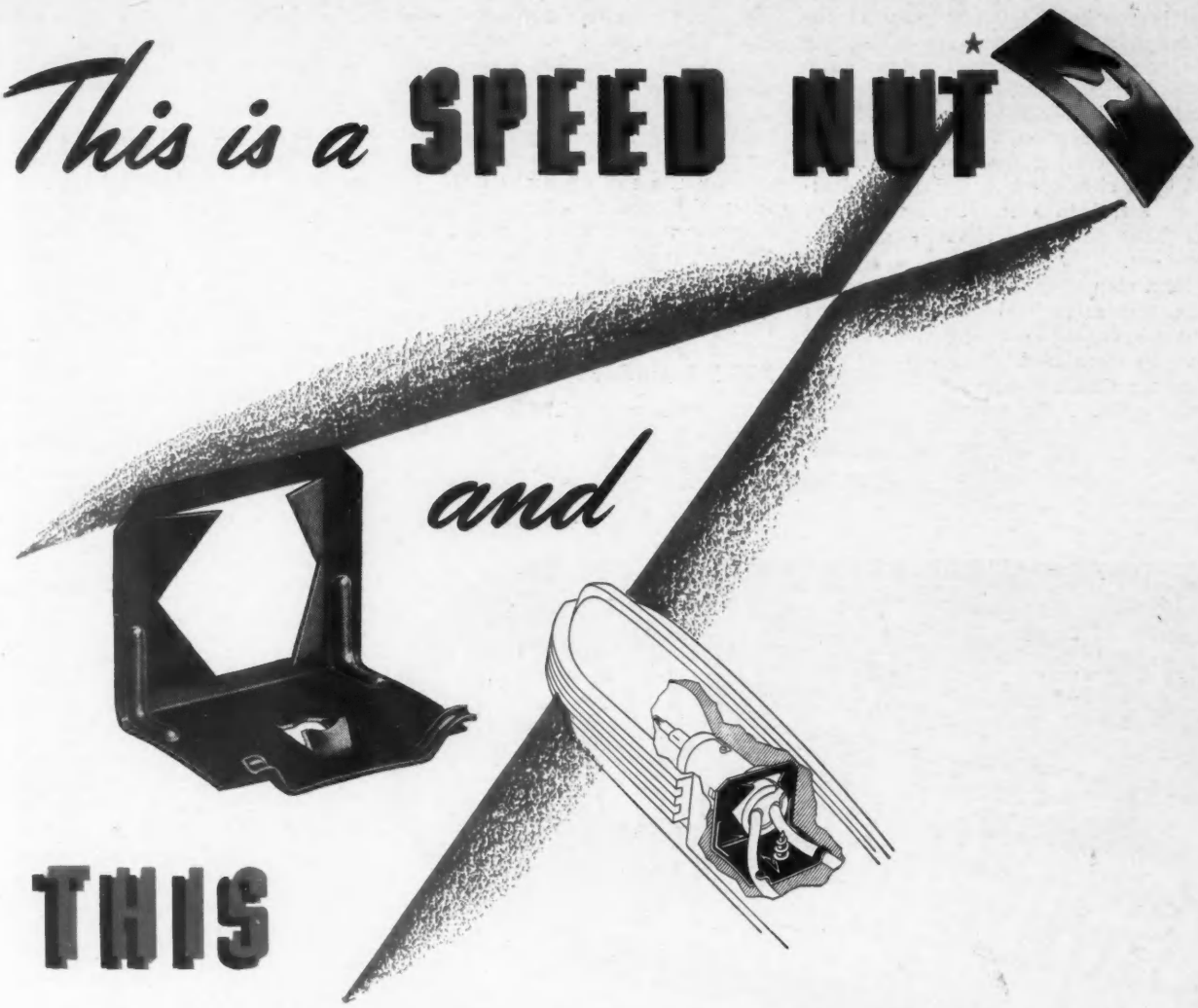
Body shells are assembled and welded in two main body framing fixtures. In loading the fixture, the procedure is to fit the underbody securely on a dummy chassis frame which is then rolled into the fixture and locked in place. Door pillars then are set in place and welded permanently. Following this, the operators install the front section and rear section sub-assemblies —prepared at the side—then apply the roof panel. The entire unit is lined up and locked in place and the sections welded together into an integral shell.

After the body leaves the welding fixture it is transferred to the body-in-white conveyor line for detail welding operations and the gamut of repairs—brazing, soldering, dinging, etc., which are a part of conventional practice. Doors are hung and the bodies are polished in readiness for the paint shop.

Suspended on the overhead monorail

(*Turn to page* 76, *Please*)

This is a SPEED NUT*



and

THIS

..is also a Speed Nut!

Take a look at this *one* SPEED NUT that does *three* jobs. Conceived by our development engineers to simplify automotive parking lamp assembly, it retains light socket, spaces wires and fastens entire assembly to the base. (See sketch). It replaced four separate parts and eliminated three machining and welding operations.

This is but a typical example of the SPEED NUT Savings Factor. So flexible is the basic SPEED NUT principle, it can be incorporated in almost any conceivable shape to improve your product, speed up your assembly, reduce the number of parts and cut costs. We can give you a no-charge fastening analysis that may surprise you. Send in your assembly details today.

TINNERMAN PRODUCTS, INC.,
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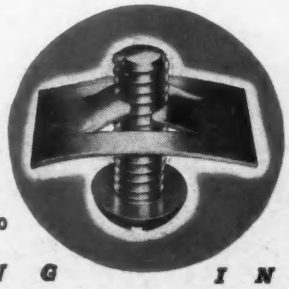
In England: Simmonds Aerocessories, Ltd., London
In France: Aerocessoires Simmonds, S. A., Paris
In Australia: Aerocessories, Pty. Ltd., Melbourne



Speed Nuts* PATENTED

MORE THAN 4000 SHAPES AND SIZES

*Trade Mark Reg. U. S. Pat. Off.

FASTEST THING IN FASTENINGS

the bodies in white now move to the paint shop. The first stage is cleaning of sheet metal, this being done in a group of Newcomb-Detroit units—the first a hot alkali wash; the second, a drying operation, followed by a trip through a cooling chamber. The latter, fed by a circulating system of cool filtered air, brings the temperature of the body down to about room temperature.

Next step is application of the prime coat, this after baking being followed by the spraying of the lacquer coat. It may be mentioned at this point that since the Crosley body does not use interior trim, it is necessary to paint the entire interior sheet metal—ceiling, sides, doors, etc. Consequently, the paint job is quite sizable and demands the same quality of finish both inside and out.

Following lacquer spray the body is dried, then cooled. Immediately upon leaving the cooling station the bodies enter the trim line for installation of hardware, instruments, seats, wiring, etc. As bodies are completed they are transported to the assembly building in readiness for the body drop on the final line.

Final Assembly Operations

The scene now shifts to the assembly building. At one end is the chasssis frame assembly. Frames are received in knock-down condition and are assembled entirely by welding. Not only are all frame members welded together but the various brackets and hangers are welded-on as well, thus eliminating most of the riveting found in conventional practice.

Following the usual practice, major sub-assemblies are prepared simultaneously at the side of the final asssembly conveyor. One station handles the assembly of front axles, another does the assembly of the rear axle and torque tube. All such assemblies are suspended on the monorail feeder conveyor for transport to the final line.

Block tested engines are received by truck from the Cincinnati plant and are prepared for the final line at another sub-assembly station. Here they install the clutch and transmission and accessories.

The chassis line starts with the frames up-side-down to facilitate installation of springs and axles and, before reaching the final assembly section of the line, it traverses a double chasiss spray booth installed by Newcomb-Detroit. Immediately after chassis spray the chassis reaches the turn-over station, a hoist which turns the chassis right side up on the final conveyor.

At this point the asssmbly line is fed by the wheel conveyor—wheel and tire assemblies being mounted in an adjacent station. Next major unit assembly is the engine which comes in from the engine line at the side and is transferred to the assembly line by means of a small rail-mounted Budgit hoist.

Bodies come in on the monorail conveyor which is so arranged as to permit the operator to transfer the body from the conveyor to a dolly. Following this transfer, the body is lifted by a Robbins & Meyers hoist and transported to the assembly line. Here again they have a ceiling-mounted rail for the hoist, extending from the body transfer station and looping in a U about the assembly line to facilitate spotting directly over the chassis. Incidentally, with a small body and perfection of detail and fitting, only two operators are required for body installation as contrasted with as many as four or five on some lines of the industry.

AMA Files Foreign Trade Brief with House

The Automobile Manufacturers Association filed a brief favoring a broad expansion of foreign trade with the House Ways and Means Committee on May 8, 1947. The industry heartily approved the reciprocal trade agreement negotiations now in progress in Geneva which were described in an article entitled "Future Foreign Trade and the Geneva Negotiations" in the March 1, 1947, issue of AUTOMOTIVE AND AVIATION INDUSTRIES.

THESE 81 JO-BLOCKS

—make 120,000 of the most accurate* Tools in the World!

(at a cost of less than 4 mills per tool—inspection standard "A")

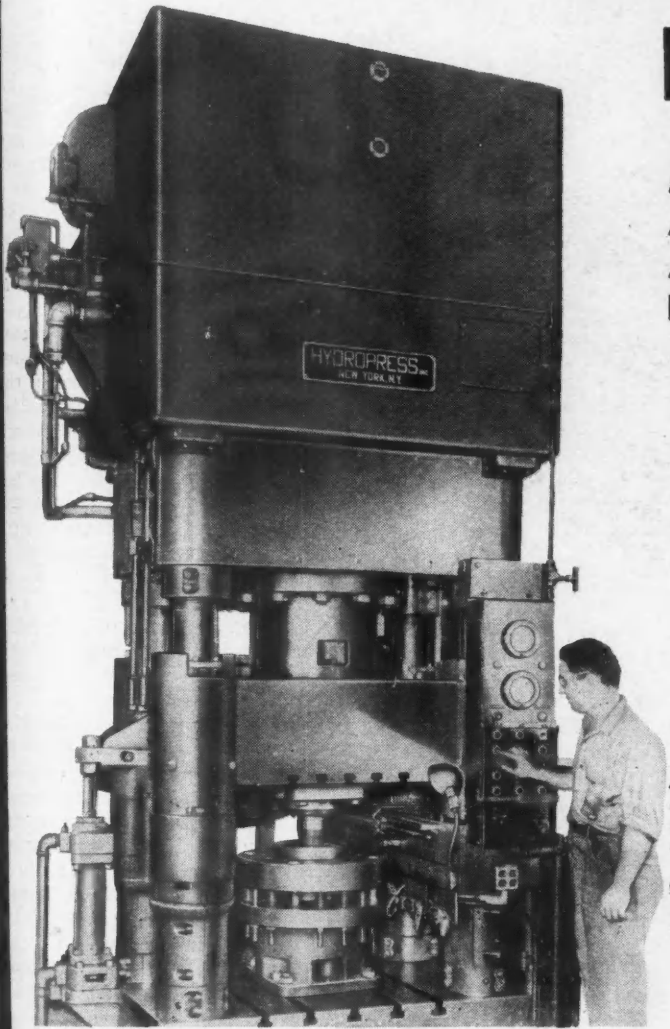
With this popular No. 1 Set of Johansson Gage Blocks, any one of 120,000 different size gages may be made up (in a few moments), in steps of .0001", from minimum size .200" to more than 12 inches. It is thoroughly practical to extend the benefits of Jo-Block precision to include inspection of close-limits production. This is particularly true of those limited-quantity jobs which might be described as "custom-production," for which permanent gaging could easily cost more than the job itself. The cost of replacing any blocks in your set that might be thus unduly worn would be negligible by comparison. Jo-Blocks are not "too good for the job"—no tool is too good for the job, if it accomplishes it better and for less money. Write for literature.

**Currently manufactured to accuracy standards of plus or minus .000002, .000004 and .000008 of an inch.*

Ford Johansson GAGE BLOCKS

FORD MOTOR COMPANY
JOHANSSON DIVISION
3602 Schaefer Road
Dearborn, Mich.

HYDRAULIC PRESSES FOR POWDER METALLURGY FOR THE AUTOMOTIVE INDUSTRY



500 TON SELF-CONTAINED OIL-HYDRAULIC
PRE-PRESSING AND COINING PRESS FOR POWDERED METAL
AT THE AMERICAN ELECTRO METAL CORP., YONKERS, N. Y.

MORE THAN SEVENTY AUTOMOTIVE PARTS ARE BEING CURRENTLY MADE FROM METAL POWDERS

GEARS FOR OIL PUMPS
POLE PIECES
OIL PUMP ROTORS
GENERATOR BRUSHES
MOTOR RESISTANCE RINGS
MOTOR ROTOR BARS
BRAKE LININGS
CLUTCH FACINGS
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1 AT A FRACTION OF COST
2 AT GREATER SPEED
3 TO CLOSE TOLERANCES
4 WITH LITTLE OR NO MACHINING
5 AT NO SCRAP LOSS

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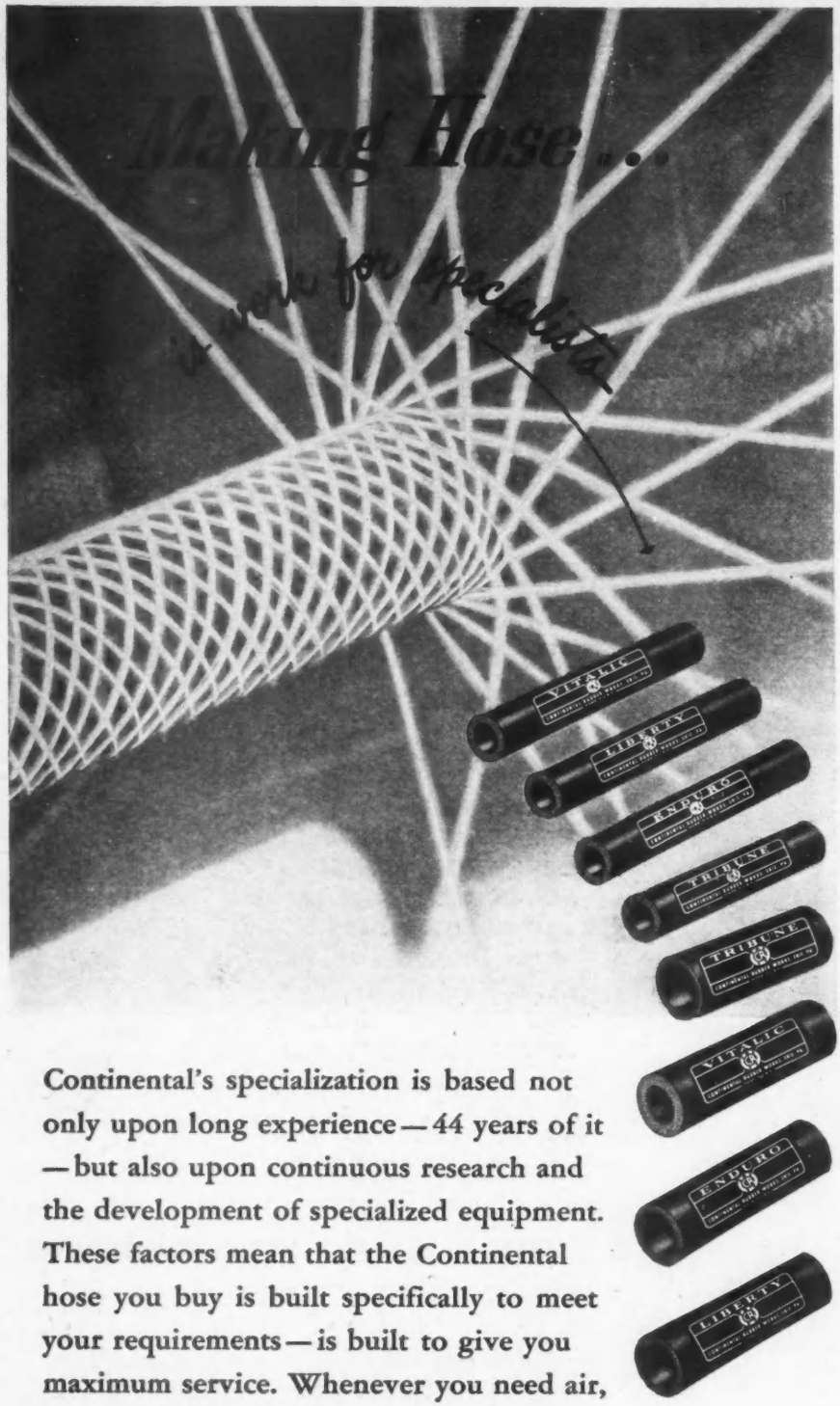

Continental's specialization is based not only upon long experience—44 years of it—but also upon continuous research and the development of specialized equipment. These factors mean that the Continental hose you buy is built specifically to meet your requirements—is built to give you maximum service. Whenever you need air, welding, water, steam, or suction hose, why not consult Continental?

See Our Catalog in Sweet's

Rubber by **CONTINENTAL**

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Baltimore, Md. Boston, Mass. Buffalo, N. Y. Chicago, Ill. Cincinnati, Ohio Cleveland, Ohio Dallas, Texas
Dayton, Ohio Detroit, Mich. Greensboro, N. C. Hartford, Conn. Indianapolis, Ind.
Kansas City, Mo. Los Angeles, Cal. Lutz, Fla. Memphis, Tenn. Milwaukee, Wis.
New York, N. Y. Philadelphia, Pa. Pittsburgh, Pa. Rochester, N. Y. St. Louis, Mo. San Francisco, Cal. Syracuse, N. Y.

CONTINENTAL RUBBER WORKS • ERIE, PENNA., U.S.A.

Kegresse Transmission

(*Continued from page* 41)

hydraulic pistons by means of a hollow piston-valve. The hydraulic pistons operate gear-clutches to make the necessary gear changes and, at the same time, uncover ports to permit the flow of oil to clutch-operating pistons to engage the friction clutches. In changing from one speed to another, the gear-clutch for the next speed is engaged before the friction clutch driving the previous gear train is fully released. The change is completed by the introduction of oil to the second clutch-operating piston, while that to the first is allowed to escape. The pause between gear changes is thus reduced to a minimum, and no time is allowed for the engine to race between changes. The engagement of clutches is cushioned by springs to reduce shock. In starting from rest, the friction clutch associated with first speed is engaged by the closing of a centrifugal relief-valve which opens when the engine drops to idling speed.

An important part of the gear-changing mechanism is a spring-loaded ball plunger working in grooves on the valve body of the governor-controlled piston valve. By giving a slight dwell to the action of the governor, it prevents the piston valve from floating about in an intermediate position. This, in turn, prevents the hunting that otherwise might occur if the car were driven continuously at or about a gear-change speed.

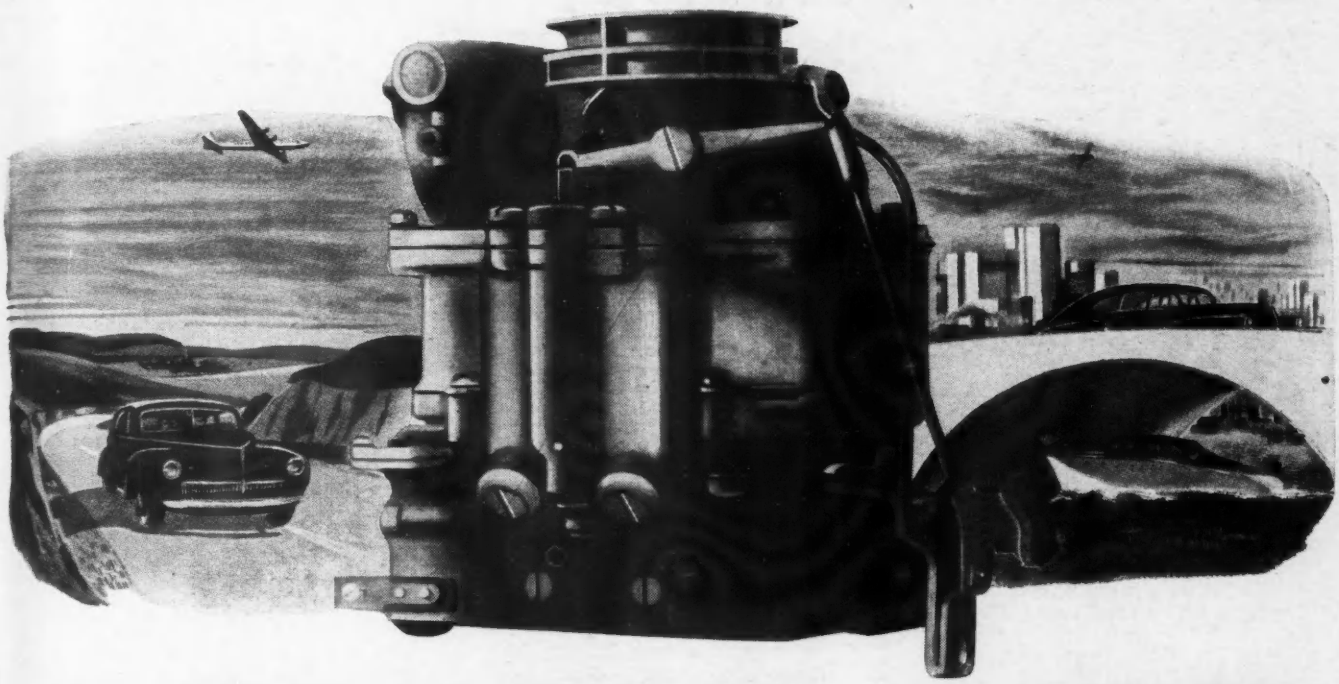
The hollow outer shaft of the main transmission shaft is supported at the flywheel end by a bushing on the inner shaft. At the other end it is supported by a double-row ball-bearing, beyond which it projects to carry the second and fourth speed driving pinions. The inner shaft is supported at the flywheel end by a ball bearing, and at the other end by a double-row ball bearing. In addition, it is provided with a bushing on the projecting end of the outer shaft. A thrust ball bearing running in grooves in the faces of the third and fourth speed pinions takes any end thrust between the two shafts. The output shaft carries the driving pinion of the differential, and is supported against the pinion by a large single ball bearing. End thrust is taken by a double-row bearing at the other end.

The Kegresse system, originally intended for the front-wheel drive Citroen, can be designed for application to direct-drive transmisssion. Two arrangements are possible, both of which require two drive shafts. In one case, the two shafts are positioned separately, an upper one serving for second speed and a lower one for first, third and reverse. In the other arrangement, the two shafts are concentric, with the outer one for second, and the inner for first and third. In both cases, fourth speed is direct.

wherever gasoline *GOES*

STROMBERG

REG. U. S. PAT. OFF.



STANDS OUT

for reliable carburetion

ECLIPSE MACHINE DIVISION of

ELMIRA, NEW YORK

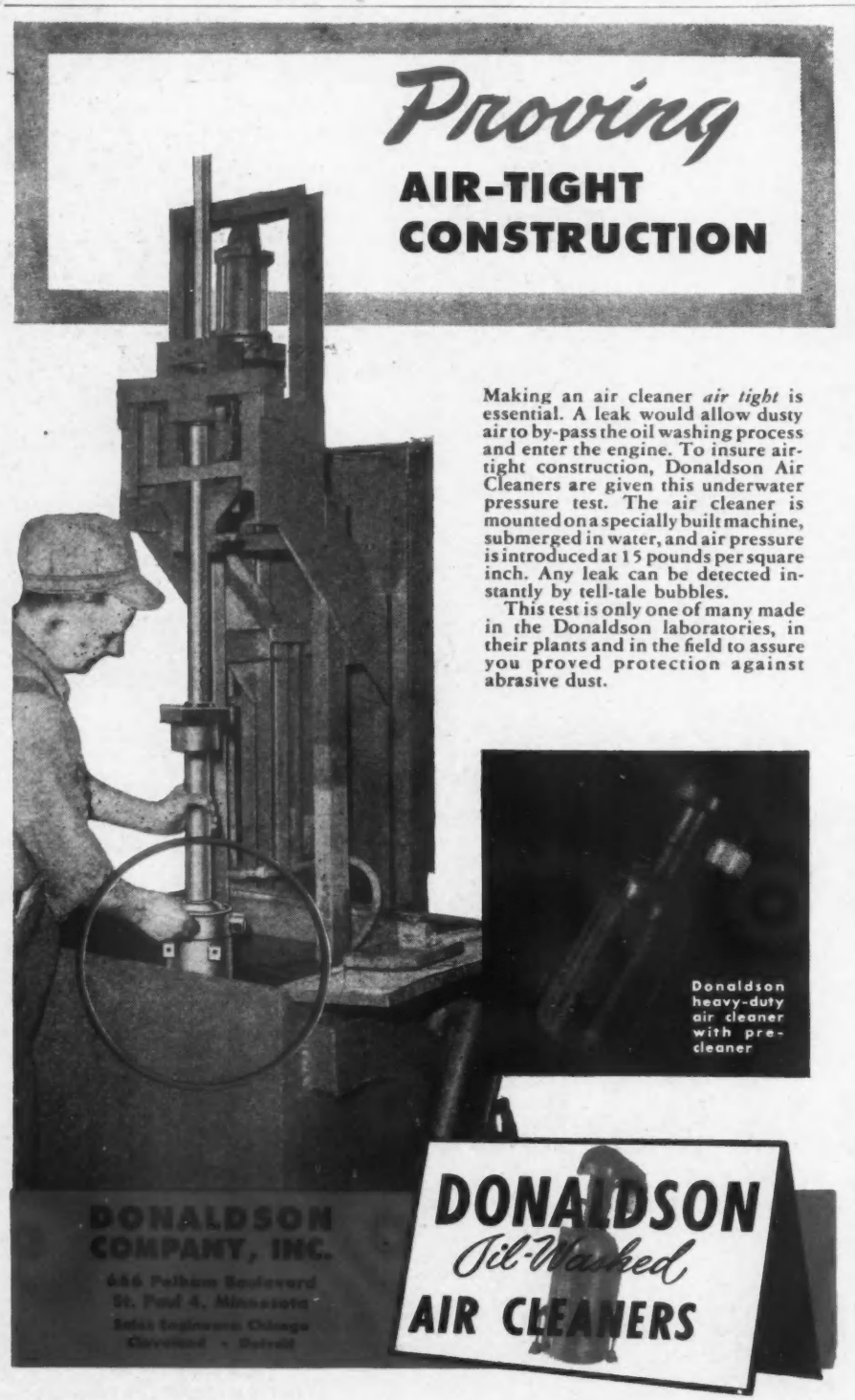
Bendix
AVIATION CORPORATION

NEW Products for AIRCRAFT

(*Continued from page* 54)

cables as temperature decreases. Due to the different metals involved in airframes and control cables, and the fact that the control cables in many instances run through heated cabins, contraction values are unequal. "Sloppy" controls result as temperatures vary.

The Bobrick cable tension regulator, a hydraulic and spring-operated unit manufactured by the Bobrick Manufacturing Corp., 1839 Blake Ave., Los Angeles 26, Calif., is said to maintain a predetermined tension on flight control cables regardless of temperature or other conditions causing slack or strain. It permits low cable tension rigging of aircraft, reducing control friction.


Proving
AIR-TIGHT CONSTRUCTION
Making an air cleaner *air tight* is essential. A leak would allow dusty air to by-pass the oil washing process and enter the engine. To insure air-tight construction, Donaldson Air Cleaners are given this underwater pressure test. The air cleaner is mounted on a specially built machine, submerged in water, and air pressure is introduced at 15 pounds per square inch. Any leak can be detected instantly by tell-tale bubbles.
This test is only one of many made in the Donaldson laboratories, in their plants and in the field to assure you proved protection against abrasive dust.
Donaldson heavy-duty air cleaner with pre-cleaner
DONALDSON COMPANY, INC.
DONALDSON Oil-Washed AIR CLEANERS

C-39—Two New Davis Products

Two new products were recently added to the line of Davis Cargo Tydown Equipment by Air Associates, Inc., Teterboro, N. J. They are a light weight telescopic escape ladder, and a newly designed hand truck. The latter answers the dual purpose of a loading hand truck and it can also be used as a ladder from the ground to the hatch of a DC-3.

The principal feature of the hand truck is the ball-bearing "bread roller" which replaces the conventional hand-truck wheels. The roller will not catch in plane-floor corrugations or wear grooves in the floor coverings. Weighing only six lb, the dual-purpose hand truck can be flown with the cargo and used for both loading, unloading and access to the ground. This hand truck can support a 1000-lb load.

Davis hand truck

The escape ladder is made of a magnesium alloy and, in the three-section size suitable for DC-4 use, weighs only 12 lb. It becomes instantly ready for use by grasping the inside section and allowing the other two sections to slide downward until they reach the ground —at which time all sections automatically lock into position.

C-40—Smoke Detectors

Weighing less than 2½ lb, two new types of aircraft smoke detectors for detection of fire in baggage and cargo compartments have just been brought out by the C-O-Two Fire Equipment Co., P. O. Box 390, Newark 1, N. J.

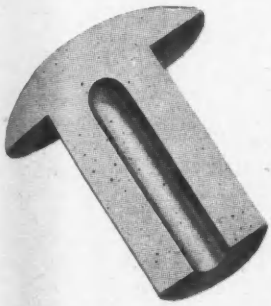
Both detectors work on the "reflection" principle. Whenever smoke appears in a beam of light inside the detector, the light is reflected by smoke particles onto the face of a photo-electric cell, giving instant warning of fire by operating an audible alarm and lighting a red smoke indicating lamp

(*Turn to page* 82, *please*)

NO. 1 OF A SERIES: *"How Du Pont Explosive Rivets do an Efficient, Economical Fastening Job—Fast"*

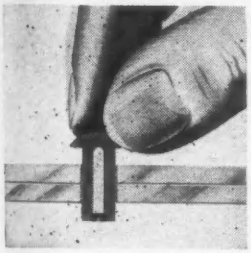
How Explosive Rivets

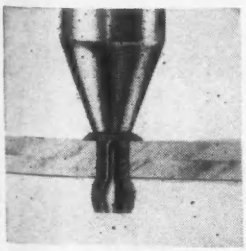
SIMPLIFY FASTENING JOBS



WHAT THEY ARE—Du Pont Explosive Rivets are strong, one-piece fasteners similar in shape to conventional, solid rivets. They have a small cavity extending the full length of the Rivet shank. This contains a minute, non-corrosive charge. Expansion of the charge sets the Rivet.

It's an easy job placing and setting Explosive Rivets on assembly-line operation.





HOW THEY WORK—One person, working from the head side of the Rivet, can easily set these high-speed fasteners with one simple operation. Rivets are inserted in prepared holes. These do not require close tolerances. Tip of a Du Pont Riveting Iron is applied to Rivet head. Heat fires the charge . . . expands Rivet shank so that it fills the hole completely. A barrel-shaped head formed on opposite end of the Rivet locks it securely in place. The Rivet requires no finishing operations and there are no parts to vibrate loose. Result is a neat, strong, tight job of fastening.

WHERE TO USE THEM—Explosive Rivets are economically used for both primary and secondary fastening jobs. Often they replace nuts and bolts and even solid rivets in open applications. They are especially suitable for fastening in hard-to-get-at places and blind spots. The Rivets are available with modified brazier or countersunk heads.

WHEN TO USE THEM—Explosive Rivets gained fame in speeding construction of aircraft. Today, they are helping manufacturers of many products simplify and speed fastening operations. Frequently they reduce the installed fastener cost. Our engineers will gladly analyze your own fastening problems . . . show how Explosive Rivets improve fastening operations. Write for manual containing the complete story of Explosive Rivets. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

OUTSTANDING FEATURES OF EXPLOSIVE RIVETS

1. Easy to insert . . . close hole tolerances unnecessary.
2. Quick to set . . . 15 to 20 Rivets a minute.
3. Large grip range permits wide use of each Rivet size.
4. Strength comparable to solid rivets.
5. One piece . . . no parts to vibrate loose.
6. No finishing operations required . . . neat appearance.
7. Safe to handle . . . use . . . store.

DU PONT EXPLOSIVE RIVETS

A Product of Du Pont Explosives Research

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

DU PONT
REG. U. S. PAT. OFF.

IN SPEEDING UP the fitting of machine parts by eliminating the precision machining otherwise required, Laminum shims actually add to the certainty of uniform accuracy . . . you simply peel laminations of known precision gauge from the solid shim. Bulletin on request.

Laminum shims are cut to your specifications. For maintenance work, however, shim materials are sold through industrial distributors.

Laminated Shim Company, Incorporated

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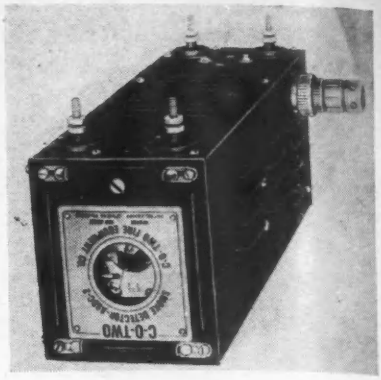
LAMINUM

THE SOLID SHIM THAT peels FOR ADJUSTMENT

2217



C-O-Two smoke detector

on the instrumental panel to show the exact location of the fire.

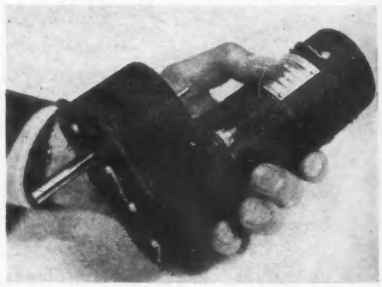
Operation of the C-O-Two convection and tube type detectors may be checked at any time by a "test" switch, located on the instrument panel, which also provides for resetting after operation or test.

The natural convection type detector requires no tubing and blower or other exhaust means; the tube type requires the use of tubing, blower or small clam-shell.

C-41—Light Weight Rotary Actuator

A new light weight, rotary type, wing-flap actuator, designed especially to meet small private airplane requirements, is available from Westinghouse Electric Corp., Aviation Division, Lima, Ohio. It weighs less than 4 lb.

The motor is rated 1/50 hp. A 435



Westinghouse wing-flap actuator

to 1 built-in gear unit makes possible an output of 130 lb-in. at 10 rpm from the normal speed of 4350 rpm. The 12-volt motor is of the reversible type and the unit is equipped with its own magnetic brake. The auxiliary shaft extension can be used to drive remote position indicators, limit switches, etc.

Readers

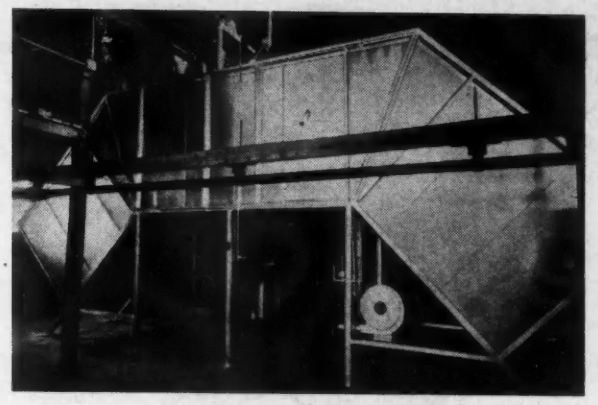
of AUTOMOTIVE *and* AVIATION INDUSTRIES are always

Well Informed

New Production and Plant

EQUIPMENT

(*Continued from page* 48)



Equipment made by Burdett Manufacturing Co. for degreasing and rustproofing

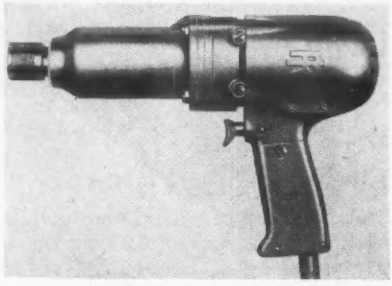
proofing process can generally be stated to be the proper placing of the gas-fired infra-red burners in relation to the work, as determined by scientific standards. This process is claimed to not only remove grease and similar film, but simultaneously produce a blue surface on the metal that is extremely rust resistant. This blue surface can be best explained as a tight scale and is said to reach hidden surfaces that are not ordinarily reached by less efficient methods.

B-35—Automatic Size Control

To eliminate or materially reduce selective fitting of pistons in automotive cylinder bores, the Micromatic Hone Corp., Detroit 4, Mich., has developed a honing tool and head that automatically controls the finished bore size. The illustration shows a Barnsdril honing machine equipped with a micromatic hydrosize six-spindle head, tools and fixtures. In a honing cycle of 30 sec, this equipment removes an average of .004 in. stock from each of the six bores, corrects out-of-roundness and taper, and holds bore to bore size to

(*Turn to page* 86, *please*)

B-36—High-Cycle Impact Wrench



Ingersoll-Rand Co., Phillipsburg, N. J., is introducing this new high-cycle impact wrench in two models, the 4E for thread sizes up to ⅜ in. and the 8E for thread sizes up to ⅝ in. These wrenches consist of light-weight high-cycle motors combined with the I-R impact unit that is used in the air-driven tool made by Ingersoll-Rand. Features are light weight, absence of torque reaction, and protection from burnouts as the motor is not stalled when the socket driver is brought to a standstill.

Why

Lamb Electric MOTORS

are going into America's Finest products

- Good Performance
- Dependability
- Light Weight
- Compactness
- Appearance Appeal
- Value Appeal
- Low Maintenance

These qualities are a valuable asset to any product requiring a special application motor.

THE LAMB ELECTRIC COMPANY
KENT, OHIO

Lamb Electric
SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS

"we proved our ability to be of service . . ."

says W. H. Hulster
STUART OIL COMPANY
REPRESENTATIVE

Stuart Oil Performance Report on ThredKut 61

Type of product manufactured by company covered in this report:
Machined parts from rough forgings

Personnel interviewed:
Machine Shop Supt. and General Foreman

Stuart Oil Products used in this plant:
ThredKut 61, Solvol

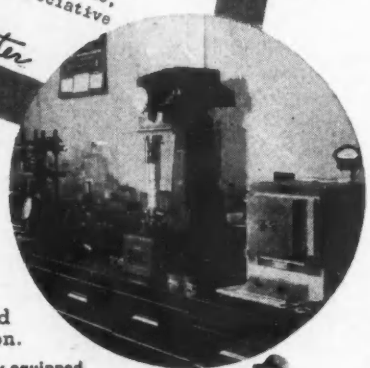
Specific operations covered by this report:
Drilling and boring forged "5060" steel pump liners

Performance details:
"Problem was presented here in boring 7⅛" dia. holes through 11" dia. x 30½" solid forged pump liners running about 170 Br. Liners are run on two heavy duty lathes, one starting with a 1" dia. drill followed with a boring bar; the other a heavy boring bar used for removing entire 7⅛" of stock.

"Solvol was performing well on 4615 steel, but when 5060 steel was substituted, they could barely get 1 to 1½ liners per day, from one lathe. Switching to ThredKut, tool life improved, but still only got one liner per tool grind, plus terrific vibration.

"Then they called us in on the trouble. Our inspection of tools indicated dilution was in order. A 6-1 blend of ThredKut and Pffe. was decided upon...and it licked the job...they now turn out 3½ liners per day per lathe, meeting production schedules...and are very appreciative of our help in solving this problem."

W. H. Hulster



HERE is another case where Stuart engineering service played an important part in solving a tough cutting problem. No "panacea" for all metal-working ills, Stuart Oil products must be used correctly to meet specific requirements. In this instance, the *right* oil was being used, but without necessary dilution. Our background and experience in helping to solve scores of similar problems is available to assist you in analyzing cutting fluid requirements. Write for further information.

Illustrated is one section of the completely equipped Stuart Metallurgical Laboratory, where the "Straight Line to Metal-Working Efficiency" begins.

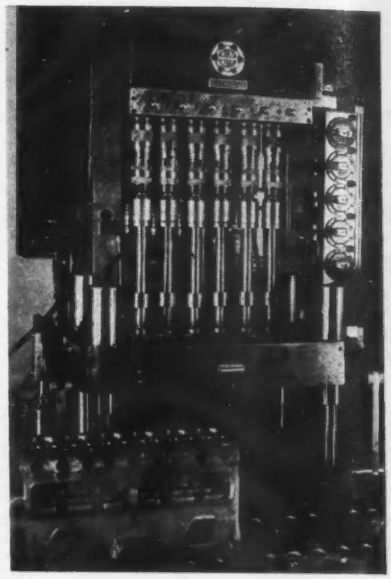
D.A. Stuart Oil Co.
EST. 1865 LIMITED
2733 SOUTH TROY STREET, CHICAGO 23, ILL.

STUART *service goes with every barrel*

New Production and Plant

EQUIPMENT

not over a .0005 in. variation. The operator loads the block into the fixture and presses the button to start the honing cycle. The feed-out of the tool,



Micromatic Hydrosize six-spindle head, tools and fixtures

the collapsing and withdrawal of the tool and the compensation for abrasive wear is entirely automatic.

Hydrosize automatic sizing may be adapted to all types of bores over two in. in diameter. The accuracy of this type of automatic sizing is not affected by ports, undercuts, or heavy stock removal. Bores two in. in diameter and under are automatically sized by means of the Micromatic Microsize, which provides automatic precision within two or three "tenths."

Drop in Small Electric Power Plants

Production of electric power plants, with a capacity of 10 kw or less, amounted to 115,209 units in 1946, as against 158,676 produced in 1945, a drop of 27 per cent, according to a recent report by the Bureau of the Census. For the first time, statistics were obtained for plants other than the wind-driven type in detail for five size groups. Of the 70,316 non-wind-driven power plants sold by manufacturers in 1946, 3 per cent were between 5001 and 10,000 w; 12 per cent between 2501 and 5000 w; 67 per cent between 501 and 2500 w; 10 per cent between 301 and 500 w, and 8 per cent were 300 w or less.

FREE CATALOG

ON BELLOWS AND BELLOWS ASSEMBLIES

SPECIAL FEATURE
20 by 14-inch chart included showing "Vapor Pressure—Temperature Relationships of Charging Liquids."

TELLS how you can simplify your product design—make it better at less cost.

DESCRIBES how Fulton Sylphon bellows and bellows assemblies are made . . . their endurance qualities . . . types, sizes, and metals available.

OUTLINES Fulton Sylphon's extensive research and engineering facilities which are available to help you solve special problems.

PROVIDES valuable information on special bellows and bellows assemblies.

30 pages jam-packed with engineering drawings, photographs and usable facts on thermostats, pressure motors, shaft seals, expansion chambers, etc.

SEND FOR YOUR COPY TODAY

FULTON SYLPHON

FIRST WITH BELLOWS

Temperature Controls • Bellows • Bellows Assemblies

THE FULTON SYLPHON CO. • KNOXVILLE 4, TENNESSEE

Canadian Representatives, Darling Brothers, Montreal

The Fulton Sylphon Co. • Knoxville, Tenn.

Gentlemen: Please send me a free copy of your catalog JB-1300.

Name_____

Title_____ Company_____

Address_____

New PRODUCTS

(*Continued from page* 56)

ambient and at high temperatures.

The SF-4 embodies many of the principles of the Sonntag Universal fatigue machine, particularly the automatic maintenance of a constant load throughout the whole period of the test. No recalibration is needed while the test is in progress.

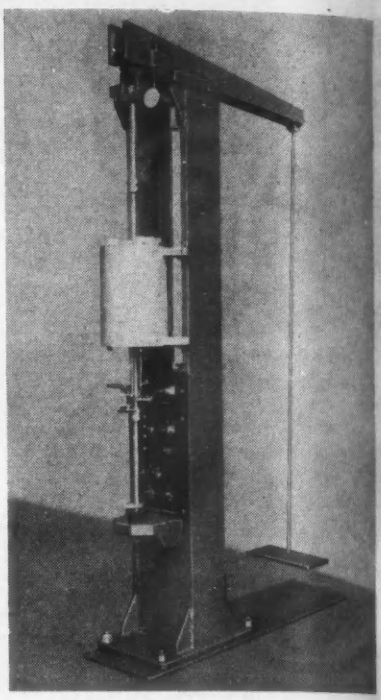
Maximum capacity of the new machine in either direction is 10,000 lb; static pre-load capacity, 0 to 5,000 lb; alternating (dynamic) load capacity, plus or minus 5,000 lb; speed of testing, 3600 load cpm; maximum movement of reciprocating platen, plus or minus one-sixteenth in. Weight of the machine is 3,000 lb and overall dimensions 43 in. by 43 in. by 75 in. high.

C-44—Self-Centralizing Indicator Gage

Federal Products Corp., 1144 Eddy St., Providence, R. I., has added to its line a small hole gage for inspection of inside diameters between .250 in. and .500 in. Known as the Model 1204, it shows size variations in tenths of thousandths of an inch.

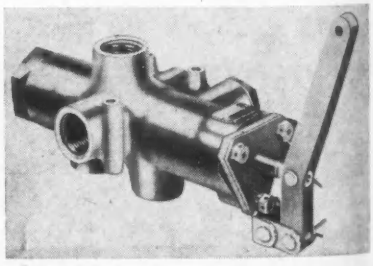
The spring-centralizing design, plus the precise measuring contacts and motion transfer units locate themselves in the hole and are said to show the true diameter reading with a high degree of accuracy. The gage employs 14 interchangeable extensions to cover the full range from ¼ in. to ½ in. It explores any hole within its capacity to a maximum depth of 2¼ in., revealing diameter and also roundness, taper, bellmouth, and other hole inaccuracies.

(*Turn to page* 90, *please*)



The Baldwin creeptesting machine with furnace in which specimen is heated to desired temperature

C-45—Lever Operated Selector Valve



Designed primarily for open-center type hydraulic systems, this landing gear selector valve, a recent development of Vickers Inc., 1400 Oakman Blvd., Detroit 32, Mich., directs hydraulic fluid under pressure to either side of an operating cylinder or motor. The valve will return automatically to the neutral open-center position when the landing gear cycle is completed

**7 out of 11 manufacturers rated AAAA in Thomas' Register*

Sure, those numbers show a one-sided preference for Oakite cleaning materials. But that preference also means that Oakite materials have proved their cleaning effectiveness right on the job under the toughest conditions. Helped produce quality work at low per-unit cost. That's why 7 of those 11 leading makers of radiators insist on Oakite materials for such production cleaning jobs as removing stamping and cutting paste, cleaning cores before soldering, cleaning parts before painting and enameling, rust-proofing parts between operations. They *know* they can depend on Oakite materials for the precise degree of cleanliness so necessary to the production of quality radiators.

How YOU Can Profit!

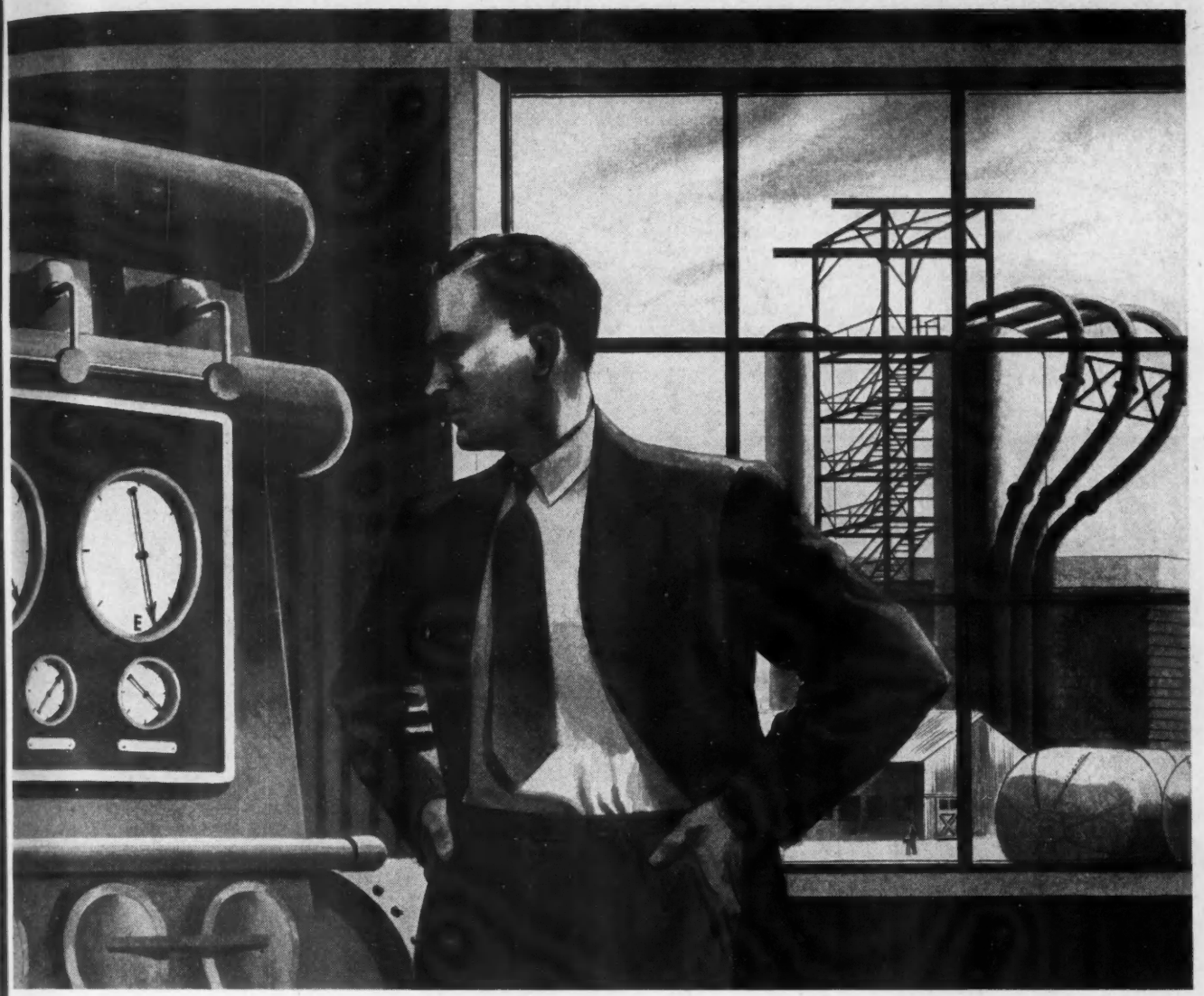
No matter what product you make, it'll pay you to investigate Oakite materials for your descaling, derusting, degreasing, decarbonizing, paintstripping and related cleaning procedures. The long list of Oakite materials includes alkaline, solvent and acidic type compounds deliberately designed to give you more cleaning work in less time for less money. If you want help to solve your production-cleaning problem, ask your nearby Oakite Technical Service Representative to stop in. He'll make recommendations sure to meet your most exacting cleaning requirements. Or, if you prefer, send for technical data on any phase of cleaning. Both service and literature—yours for the asking. Write Oakite Products, Inc., 28A Thames Street, New York 6, N. Y.

OAKITE

REG. U. S. PAT. OFF.

SPECIALIZED CLEANING MATERIALS • METHODS • SERVICE

Technical Representatives in Principal Cities of U. S. & Canada



Even an oil company can use too much oil!

The chief engineer of a big Illinois petroleum company was pleased with the smooth, steady performance of the new Diesel he had installed. Then he checked the oil consumption and his enthusiasm ended.

The Diesel was stopped . . . Pedrick experts called in . . . and after a quick but thorough analysis, Pedrick *precisioneered* piston rings designed to meet the special requirements of this type of engine were substituted for the original rings.

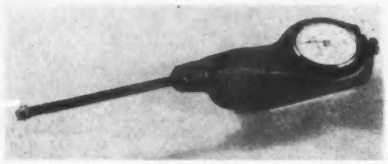
Horsepower hours per gallon of lubrication oil were immediately more than *doubled*, and after the Pedrick rings had seated themselves, were more than *tripled!*

Amazing? Not particularly. Pedrick installations in all types of internal combustion engines are cutting operating costs and increasing efficiency. Used as original equipment they help improve new engine performance. In Service Sets for reconditioning they wear-in better and stand-up longer. Let Pedrick engineers show you why. WILKENING MANUFACTURING Co. Philadelphia 42, Pa. *In Canada:* Wilkening Manufacturing Co. (Canada) Ltd., Toronto.

Pedrick

precisioneered
PISTON RINGS

New PRODUCTS



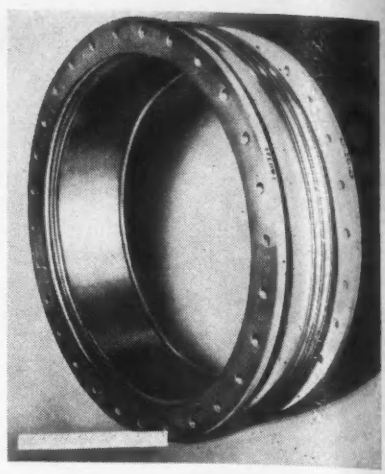
Federal Model 1204 gage

Model 1204 is used as a single-purpose inspection tool or for checking a large variety of sizes. It shows how much a dimension varies, not only whether it's in or out of tolerance. Being a point-to-point contact gage, it reveals any small area imperfections in the hole. All contacts, both measuring and centralizing, are hard chrome plated.

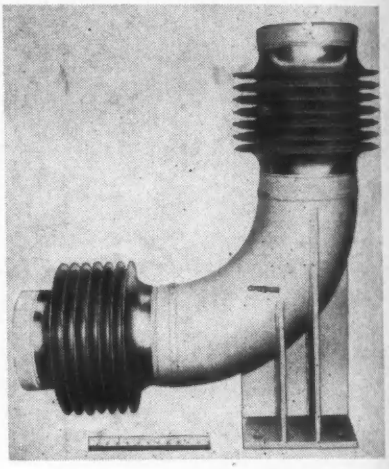
C-46—Packless Expansion Joints

A standard line of new low pressure, large-diameter packless expansion joints ranging in sizes from 14 in. to 6 ft in diameter is now in production at MagniLastic, Chicago 14, Ill.

This latest addition to MagniLastic's complete line of expansion joints, applicable for all pipe sizes, temperatures and pressures, is normally supplied in type 347 stainless steel to accommodate pressures up to 30 psi. Other metals may be specified when required.



MagniLastic large diameter expansion joint



MagniLastic anchored elbow expansion joint

In addition, MagniLastic has recently added a new packless anchor base "Elbow" expansion joint to its standard catalog line. It can be supplied in all standard pipe sizes and in a choice of materials to meet special corrosive, temperature and pressure conditions.

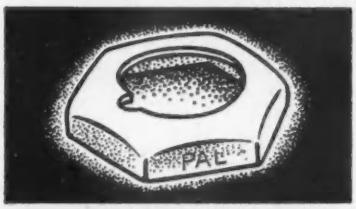
The cut illustrates a 10 in. pipe size unit approximately 4 ft high which was built to accommodate 40 psi of steam pressure. Each bellows allows 1½ in. total movement with 30 in. overall free length. The bellows of this unit is fabricated from stainless steel and the "L" used is standard weight 10 in. carbon steel pipe.

C-47—Cleaners for Welding Tips

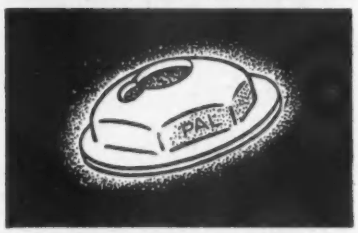
Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y., has added two sets of Wypo tip cleaners, for use

(*Turn to page 92, please*)

PALNUT SELF-LOCKING NUTS
For speedy low-cost assembly



Inverted PALNUTS
For moulding strips, medallions, tail and parking lights, radiator grilles.



Washer PALNUTS
Recommended for above applications where washer type base is desirable.

Acorn PALNUTS
Pleasing dome shape covers bolt ends, improves appearance, protects car owners from injury. Used on glove compartments, rear decks and license brackets.

Send details of assembly for samples and data

THE PALNUT COMPANY
60 CORDIER STREET • IRVINGTON 11, N. J.
DETROIT OFFICE: 3-213 GENERAL MOTORS BUILDING

PALNUT SELF-LOCKING NUTS

...Putting the FINGER on Costs

Calculating costs by machine is no job for big, muscular fingers. The slender, agile hands of a girl produce your answers much more quickly and accurately. You don't need brute strength in your cost department—what you want is speed and precision.

But out in the shop, where costs are really determined, it's a different story. There the combination of speed and precision in machinery of tremendous power pays off in dollars. As every production man knows, no other method can beat *press* costs in volume operations because pressed parts are finished parts, but until Clearing came into the picture, tolerances on stampings were never expected to be very close.

Today, with a Clearing, you can get *press*-production economy on many parts formerly made by more costly methods. Large or small, Clearing presses control their brute power so accurately that variations in the finished output can be expressed only in thousandths. If you're cost-minded, that should mean a great deal to you.

Let Clearing engineers work with you in planning your production on *presses*—the economical way. Let us show you how Clearing's unique design and construction features make such economy practical in new production techniques. It costs you nothing to put your problems up to our experienced staff.

MECHANICAL AND HYDRAULIC PRESSES ★ 45 TONS CAPACITY AND LARGER

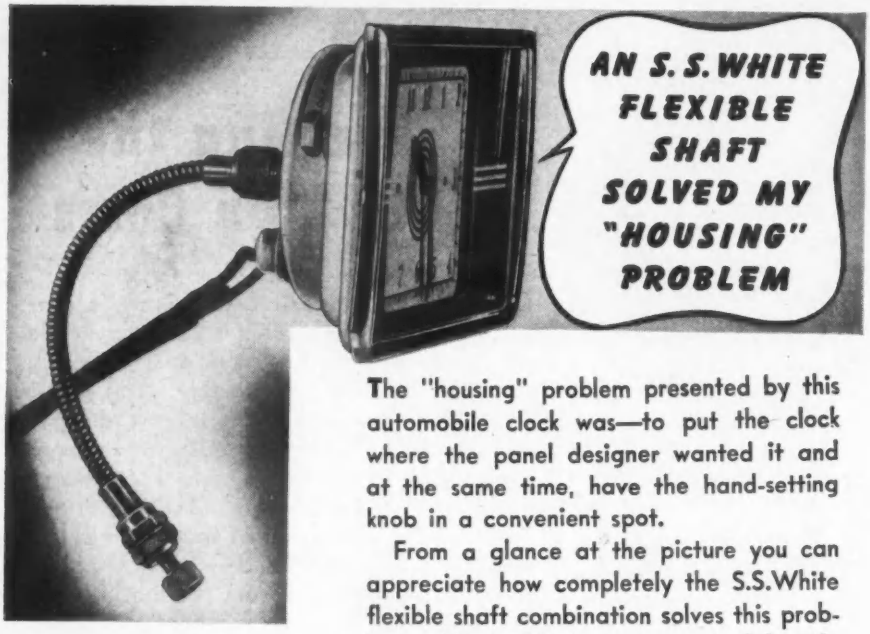
CLEARING

THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION

6499 WEST 65TH STREET • CHICAGO 38, ILLINOIS

A *Timely* MESSAGE FOR DESIGN ENGINEERS . . .



SOME AUTOMOTIVE APPLICATIONS OF S.S.WHITE SHAFTS

REMOTE CONTROL

Choke Valves
Clock Setting
Drain Valves
Engine Governors
Mileage Reset
Radios
Radio Antennae
Spotlights
Heaters

POWER DRIVE

Movable Tops
Speedometers
Taximeters
Truck Recorders
Windshield Wipers

The "housing" problem presented by this automobile clock was—to put the clock where the panel designer wanted it and at the same time, have the hand-setting knob in a convenient spot.

From a glance at the picture you can appreciate how completely the S.S.White flexible shaft combination solves this problem. Obtainable in any required length, it gives complete freedom in placing both the clock and the knob.

A similar arrangement is used for resetting trip mileage on the speedometer. Other automotive applications of S.S.White shafts are listed at the left.

The message for design engineers in these applications is this — S.S.White power drive and remote control flexible shafts completely eliminate the "housing" problem for accessories which require driving or regulation. They come in a wide selection of torque capacities which will reliably deliver power or provide smooth, sensitive control between any two points in a car, bus, truck or other motor vehicle.

GET THE FULL FLEXIBLE SHAFT STORY IN THIS 260-PAGE HANDBOOK

It gives complete information and engineering data about flexible shafts and how to select and apply them for specific requirements. To get a free copy, write direct to us on your business letterhead and mention your position.

S.S.WHITE INDUSTRIAL DIVISION
THE S. S. WHITE DENTAL MFG. CO.
DEPT. A, 10 EAST 40th ST., NEW YORK 16, N. Y.
FLEXIBLE SHAFTS • FLEXIBLE SHAFT TOOLS • AIRCRAFT ACCESSORIES
SMALL CUTTING AND GRINDING TOOLS • SPECIAL FORMULA RUBBERS
MOLDED RESISTORS • PLASTIC SPECIALTIES • CONTRACT PLASTICS MOLDING

One of America's AAAA Industrial Enterprises

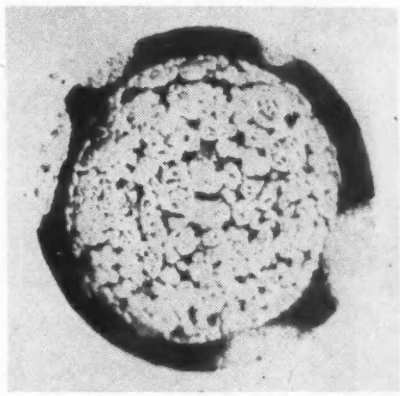
New PRODUCTS

in cleaning oxyacetylene welding and cutting tips, to its line of apparatus.

The sets of Wypo tip cleaners are available in two individual packages known as Set No. 1 and Set No. 2. Set No. 1 contains 12 cleaners for drill sizes ranging from No. 75 to No. 49. Set No. 2 contains nine cleaners for drill sizes ranging from No. 48 to No. 30.

C-48—Sintered Copper-Lead Bearing

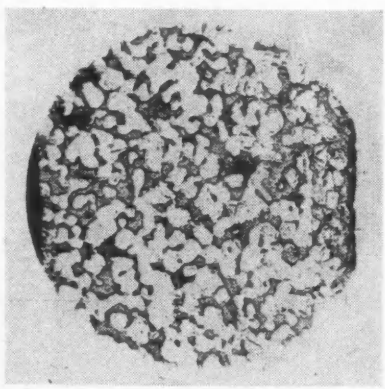
The Federal-Mogul H-24, steel back, precision type, sintered copper-lead bearing is a late development of Federal-Mogul Corp., 11037 Shoemaker,



A copper-lead alloy powder particle for the H-24 bearing as it appears at a magnification of 750X. In this photomicrograph the copper is light, the lead dark

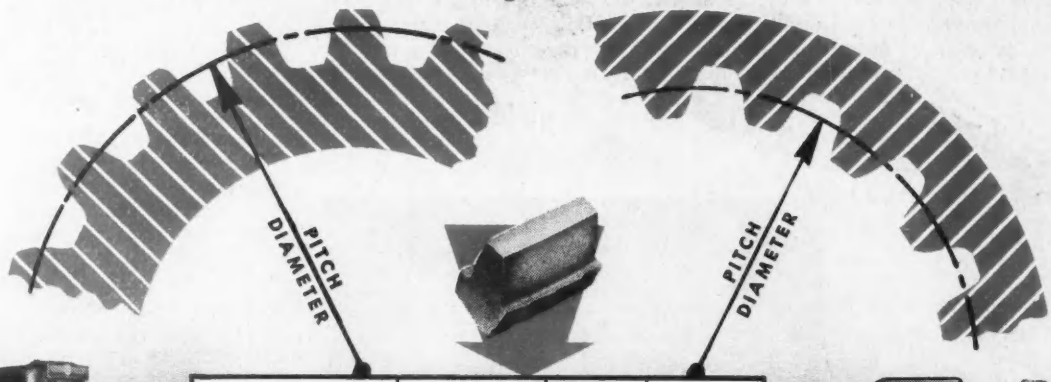
Detroit 13, Mich. This improved bearing is made from a powder consisting of the desired alloy, rather than a mixture of several powders, with a conforming overlay coating of high lead-tin, electrodeposited to a thickness of about 0.001 in.

(*Turn to page 94, please*)

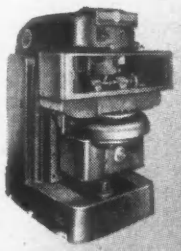


Sintered copper-lead alloy bearing lining as magnified 100X. In this photomicrograph the white areas are copper, gray areas are lead

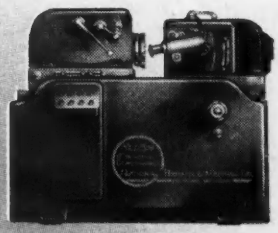
SPUR AND HELICAL GEARS ARE SHAVED AND CROWNED ON THESE RED RING MACHINES



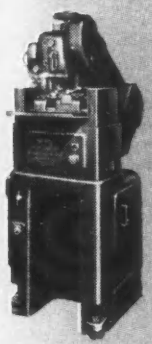
Red Ring Machine Designation	External Gears Pitch Dia.	Teeth May Be Crowned	Internal Gears Pitch Dia.
GCL-3″	3/16″— 4″		
GCI-8″	1″— 8″	Yes	3″— 8″
GCI-12″	1″— 12″	Yes	3″—12″
GCI-18″	2¼″— 18″	Yes	3″—18″
GCP-24″	3″— 24″	Yes	
GCU-8″ Diagonal	1″— 8″	Yes	
GCU-12″ Diagonal	1″— 12″	Yes	
GCR-12″			3″—12″
GCJ-36″	4″— 36″	Yes	
GCM-36″	4″— 36″		
GCQ-36″ Standard	12″— 36″		12″—36″
GCQ-36″ Spec. Small	5″— 30″		5″—30″
GCQ-48″	22″— 48″		22″—48″
GCM-48″	4″— 48″		
GCK-96″	24″— 96″		
GCK-120″	48″—120″		



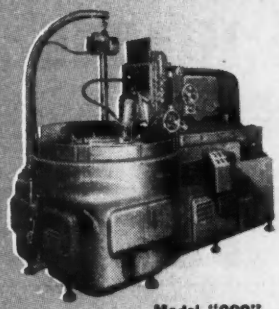
Model "GCU" Diagonal



Model "GCR" Internal

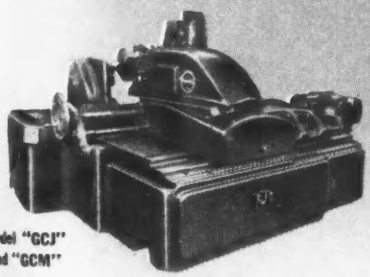


Model "GCL" Fine Pitch



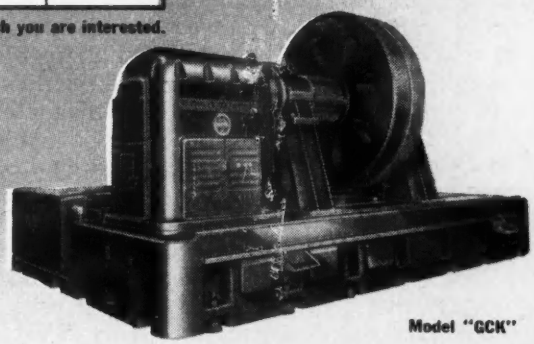
Model "GCQ"

Write for descriptive folder on the machine in which you are interested.



Model "GCJ" and "GCM"

Model "GCI" and "GCP"



Model "GCK"

RED RING PRODUCTS

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE • ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

2526

New PRODUCTS

Bearings made from the new powder —a high-purity, copper-lead alloy— can be flanged without cracking. Lining density is said to be very high and corrosion resistance extremely good. A feature of the new copper-lead alloy is the ability to vary the lead content to extremely high percentages—up to 45 per cent is necessary—thus making it suitable for any type of crankshaft.

The H-24 bearings are produced by the continuous strip process at Federal-Mogul's Greenville plant.

C-49—Welding Electrode for Cast Iron

"Nicast" is a new P&H welding electrode developed by the Harnischfeger Corp., Milwaukee 14, Wis., for welding cast iron. It is used with either direct or alternating current. Welds produced by "Nicast" are said to be strong and non-porous and fully machinable in both the weld and fusion zone areas. The unusual machinability of "Nicast" makes it possible to drill, tap, mill or machine weld deposits in any manner, shape or form.

This new P&H Electrode is particularly adaptable to the repairing of broken castings, building up worn castings, correcting machining errors and welding cast iron to steel.

Most applications require no preheating or post-heating and welds will withstand hydrostatic pressure. "Nicast" is an all-position electrode and performs well in flat, vertical, overhead or horizontal work.

The new electrode is now available in either ⅛-in. or 5/32-in. by 14-in. sizes.

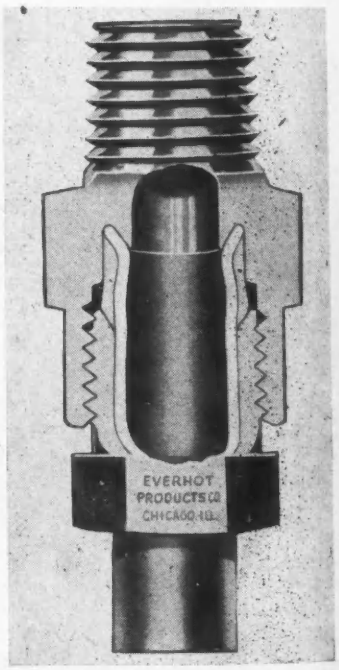
C-50—Heater for Trailer Coaches

The South Wind Division of Stewart-Warner Corp., Indianapolis, Ind., has recently placed on the market a heater designed for trailer coaches. Equipped with automatic electrical ignition and safety control, it burns any grade of automotive gasoline in a sealed, stainless steel chamber.

The unit is designed to operate on 110 volt, 60 cycle alternating current. Automatic thermostat controls regulate heat output to maintain desired temperature. Automatic ignition supplies quick heat and the compartment is kept warm by a constant circulation of warm air at the rate of 120 cfm. Weighing only 30 lb, the unit, including an all steel chassis, is 11 in. high, 23 in. long and 10½ in. wide

(*Turn to page 96, please*)

C-51—Self-Flaring Tube Connector Fitting



This is a cut-away view of the Everseal self-flaring fitting made by Everhot Products Co., 2001 W. Carroll Ave., Chicago 12, Ill. This new fitting produces a 37-deg flare that is said to assure a seat capable of withstanding a pressure of more than 8,600 psi.

50 YEARS OF DEPENDABLE IGNITION

6,000 CONTACT BREAKS A MINUTE MEAN...

FRICTION!

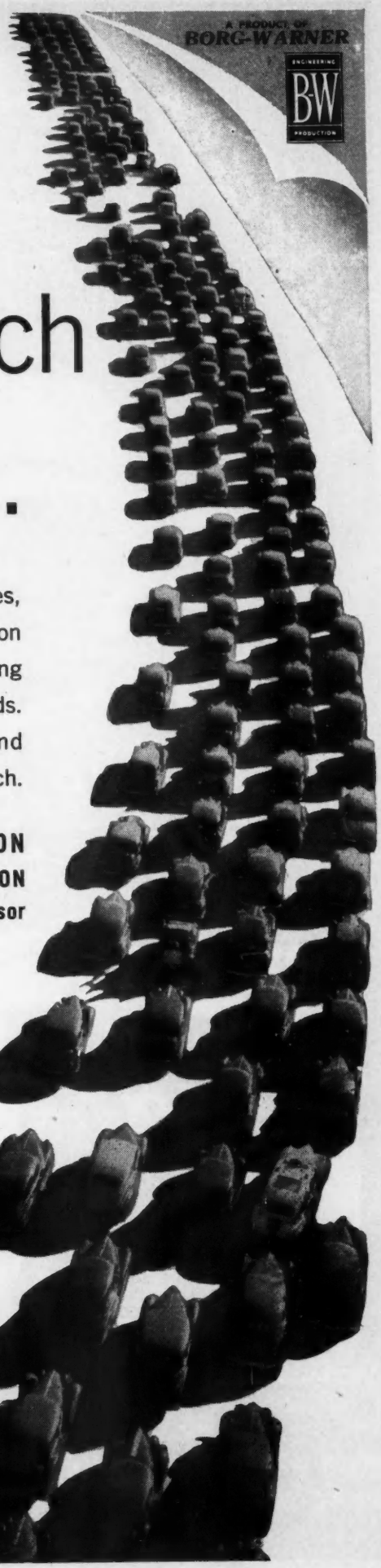
The breaker cam for the magnetic rotor on a WICO XH magneto must have a fine finish. The rotor revolves at a speed which may be anything between 200 and 3300 RPM, and the cam breaks the contact twice in each revolution on a multi-cylinder magneto. The finer the finish the less wear on the shoe — and a worn shoe will affect the spark timing. That's why infinite pains, on this fine grinder by an experienced man, are necessary to meet WICO quality standards. For WICO sparks, delivered thousands a minute, must be timed precisely.

This is just one of a score of operations that WICO's fifty years of magneto experience have developed to assure the finest magnetos built.

The postwar "X" models, the last word in magneto ignition, are all built to 1947 aircraft standards. The world's largest manufacturer of magnetos exclusively, WICO equips America's aristocrats in spark-ignited engines — and at great economy. Trained field engineers and more than a thousand authorized service stations sell WICOs and serve buyers and users everywhere. Wico Electric Company, West Springfield, Mass.

WICO MAGNETO 50 YEARS OF DEPENDABLE IGNITION

Traffic Driving PROVES Long Clutch Quality . . .

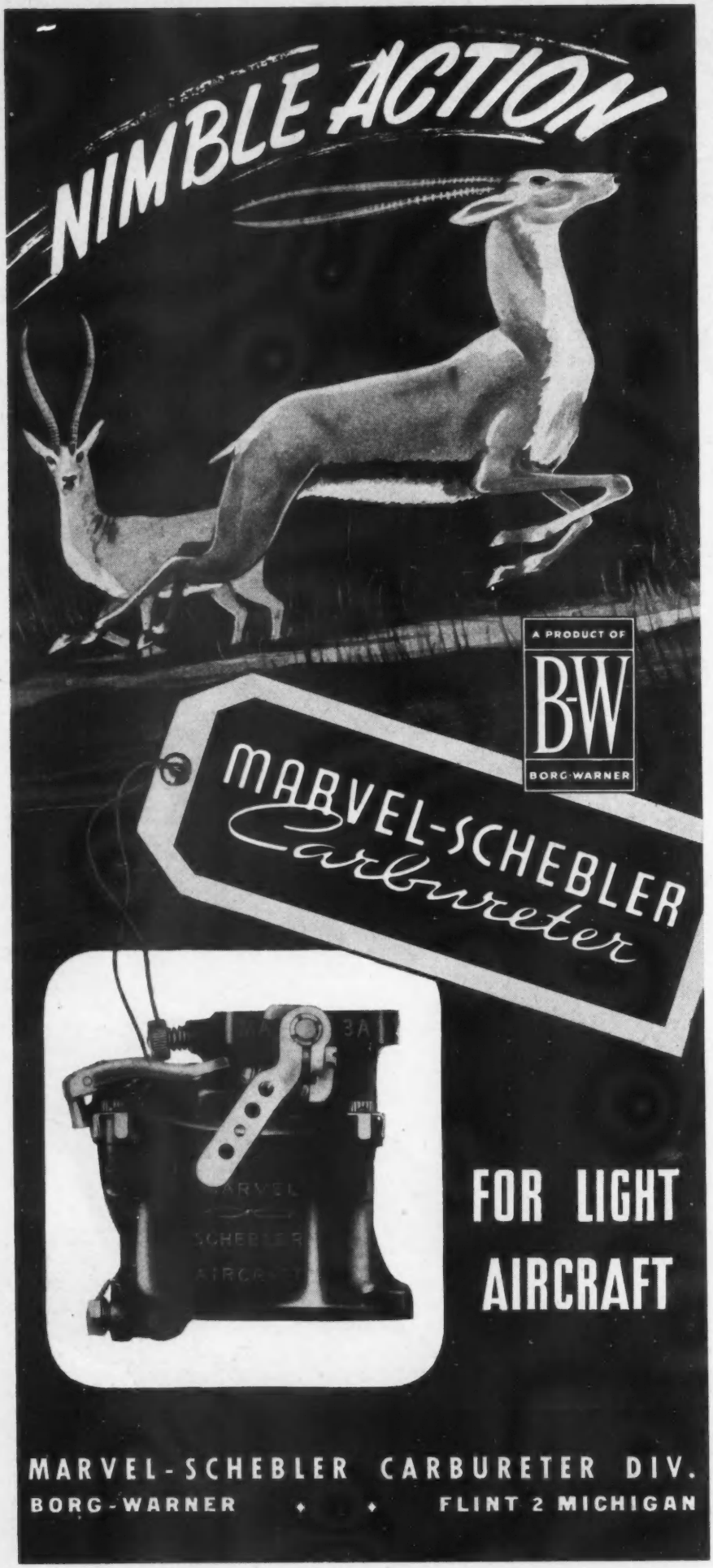


In those bumper-to-bumper, stop-and-go traffic lines, car owners appreciate the smooth, easy, positive action of the Long clutch. And, in highway driving, the Long clutch has increased torque capacity at greater speeds. Since 1922, millions of cars, buses, trucks and tractors have been equipped with the Long clutch.

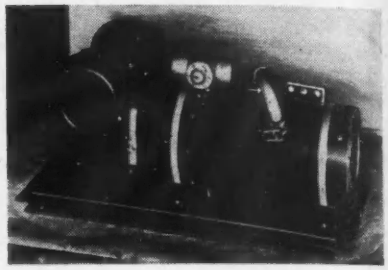
LONG MANUFACTURING DIVISION
BORG-WARNER CORPORATION
Detroit 12, and Windsor

LONG

CLUTCHES • RADIATORS • OIL COOLERS



New PRODUCTS



South Wind trailer heater

This new heater is adaptable to any type trailer coach regardless of layout or design as well as the automatic heating of other small shelters.

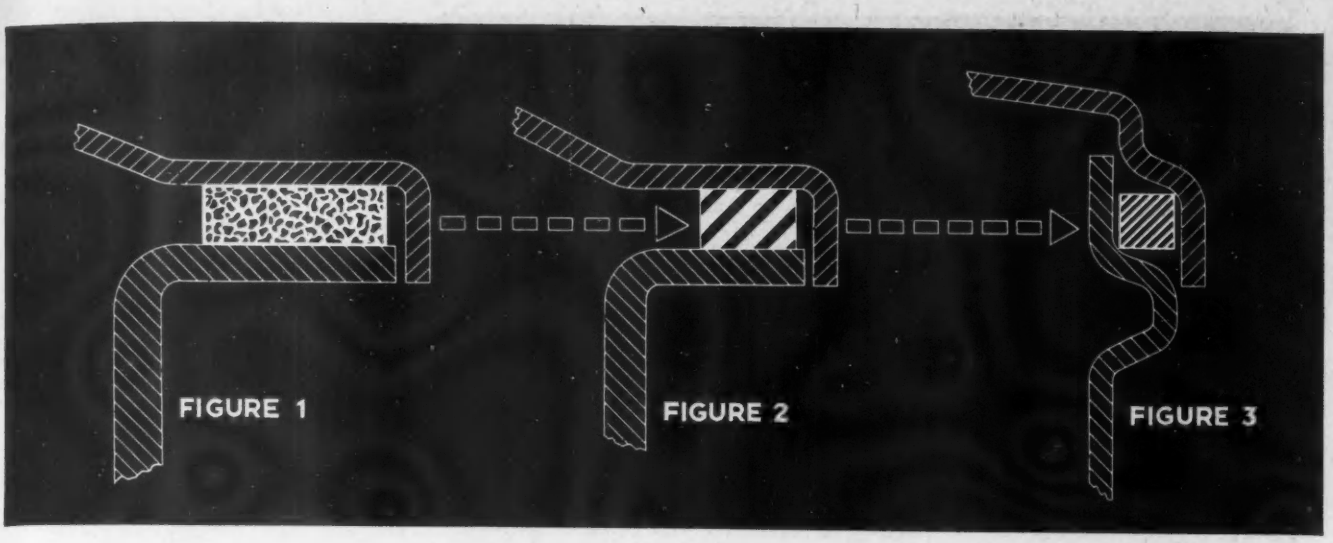
C-52—Hand Tachometer

A new hand tachometer, is announced by AC Spark Plug Division of General Motors. The device makes possible a quick and positive checking of speeds, both clockwise and counter clockwise, of motors, drill presses, shafts, tractor power take-offs, cylinder speeds of combines, circular saws, grinding wheels, office accounting machines, etc.

(*Turn to page 98, please*)

C-53—Truck Tires with Nylon Cords

A premium "super" truck tire with all plies constructed of nylon cords developed expressly for truck tire service has been brought out by the Goodyear Tire & Rubber Co., Akron, Ohio. This is said to be the first truck tire of all nylon plies introduced to the market. A pre-stretching technique for nylon cord, developed in Goodyear's research laboratories, reduces the tendency of nylon to stretch or "grow" in service—a problem that delayed application of this material to truck tire use



DESIGNING GASKETS TO REDUCE COST

Simple gaskets cost less yet often perform as well as complex molded parts

The most economical gasket has the least volume of material and the simplest shape consistent with application requirements.

To realize this ideal fully, joint design should be simple mechanically. Frequently such design simplification will permit the economic use of materials that offer longer life and a better safety factor. An example of progressive development in this respect is provided by an equipment manufacturer who first used a cork composition gasket.

That first gasket necessarily was bulky in cross section (Figure 1). To reduce flange size and at the same time improve gasket life, one of Armstrong's cork-and-synthetic-rubber gasket materials was tried (Figure 2). This gasket cost about the same as the cork gasket because its relative volume was much less.

Then a change in the fluid to be sealed barred the use of any material containing cork. To meet the new service condition, Armstrong developed a special straight synthetic rubber compound. The joint was then redesigned (Figure 3) and the new compound tried in the form of molded rings. These rings sealed well, but their cost was high. Next an extruded piece was used with ends skived and cemented. This, too, provided an effective seal; but cost, while less, still was too high.

A final solution then was found by using a simple lathe-cut ring made of the same synthetic rubber material, square in cross section (Figure 3). Gasket cost, of course, was greatly reduced, yet a perfect seal was maintained.

There are many applications in which simplification of gasket shape can lead either to significant cost reduction or to improvement in safety and service factors. Thus the expense of molding or cutting intricate gaskets is avoided, as well as the extra cost of machining joints in special forms.

The possible use of a square-section gasket should be considered even where requirements inherent in the unit itself prescribe rounded or specially shaped joint surfaces, such as the rolled lip of a sheet metal case. Ordinarily a square or rectangular rubber or cork-and-rubber gasket will deform sufficiently under pressure to effect a tight seal.

We suggest that you discuss your sealing problems with an Armstrong representative while your designs still are in the development stage. Methods and materials that he may suggest may help to further simplify construction and reduce costs. In addition, he can supply samples for your experimental use. Call or write the Armstrong Industrial Division office nearest you.

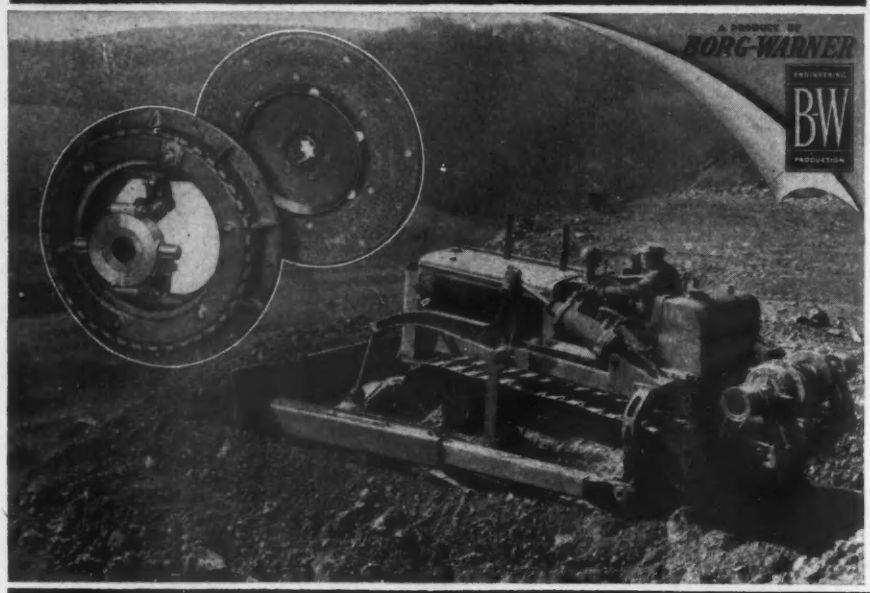
If you prefer, send drawings and details to us for review. You'll find our recommendations unbiased and keyed to good current gasketing practice.

SEND FOR FREE BOOKLET. For specification and application data on Armstrong's more than 50 resilient sealing materials, send for a free copy of the latest edition of "Gaskets, Packings, and Seals," twelve pages of helpful information. Address Armstrong Cork Company, Gaskets and Packings Department, 1505 Arch St., Lancaster, Pa.

ARMSTRONG'S
GASKETS · SEALS · PACKINGS

Cork Compositions • Cork-and-Synthetic-Rubber Compositions
Synthetic Rubber Compounds • Cork-and-Rubber Compositions
Fiber Sheet Packings • Rag Felt Papers • Natural Cork

ROCKFORD



OVER - CENTER CLUTCHES

EASY OPERATION

HIGH TORQUE

POSITIVE ENGAGEMENT

LARGE DRIVING AREA

SMOOTH RUNNING

INFREQUENT ADJUSTMENT

MINIMUM INERTIA

* The pressure plates in ROCKFORD Over-Center CLUTCHES have large area, accurately flat-ground surfaces for maximum contact with the facing material. Special alloy iron is used to withstand shock and heat strains. Provision is made for multiple driving, from the back plate. * Have hardened steel bearing insets, where the roller cams operate.

Send for This Handy Bulletin

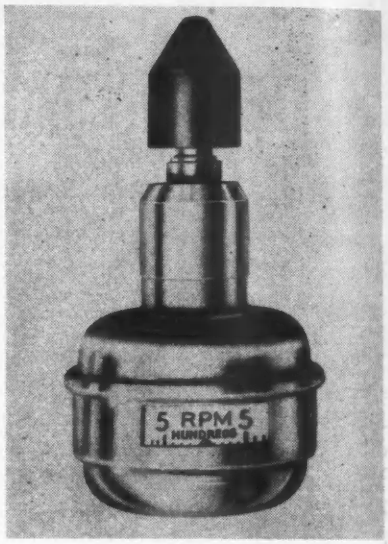
Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

ROCKFORD CLUTCH DIVISION BORG-WARNER
315 Catherine Street, Rockford, Illinois, U.S.A.

New PRODUCTS

The new hand tachometer contains many features of the regular tachometer which AC has been manufacturing for many years. A special feature is its size, which permits the operator to easily hold it in his palm when making tests. The tachometer is finished with chrome plating to withstand corrosion or rust.

It is equipped with two interchangeable rubber tips, one for recessed shafts and pulleys, the other for flat surfaces.



Tachometer made by AC Spark Plug Division of GM

Classified Advertisement

NEOPRENE SHEETING 1/16" and ⅛", neoprene strip ½" width, transparent vinylite tubing, sponge rubber pads, rubber cement 3M EC-711, hydraulic oils, rust-proofing oils. Offered at less than 50% market value to move surplus stocks. Montgomery Engineering Co., 1325 Broadway, Detroit 26, Mich.

MILLHOLLAND

Automatic DRILLING - BORING MILLING - TAPING Units

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

DIMPLING TOOLS

FOR AIRCRAFT PRODUCTION

TOPFLIGHT TOOL CO.
YORK, PENNSYLVANIA

UTILIZE OUR MACHINE SHOP FACILITIES

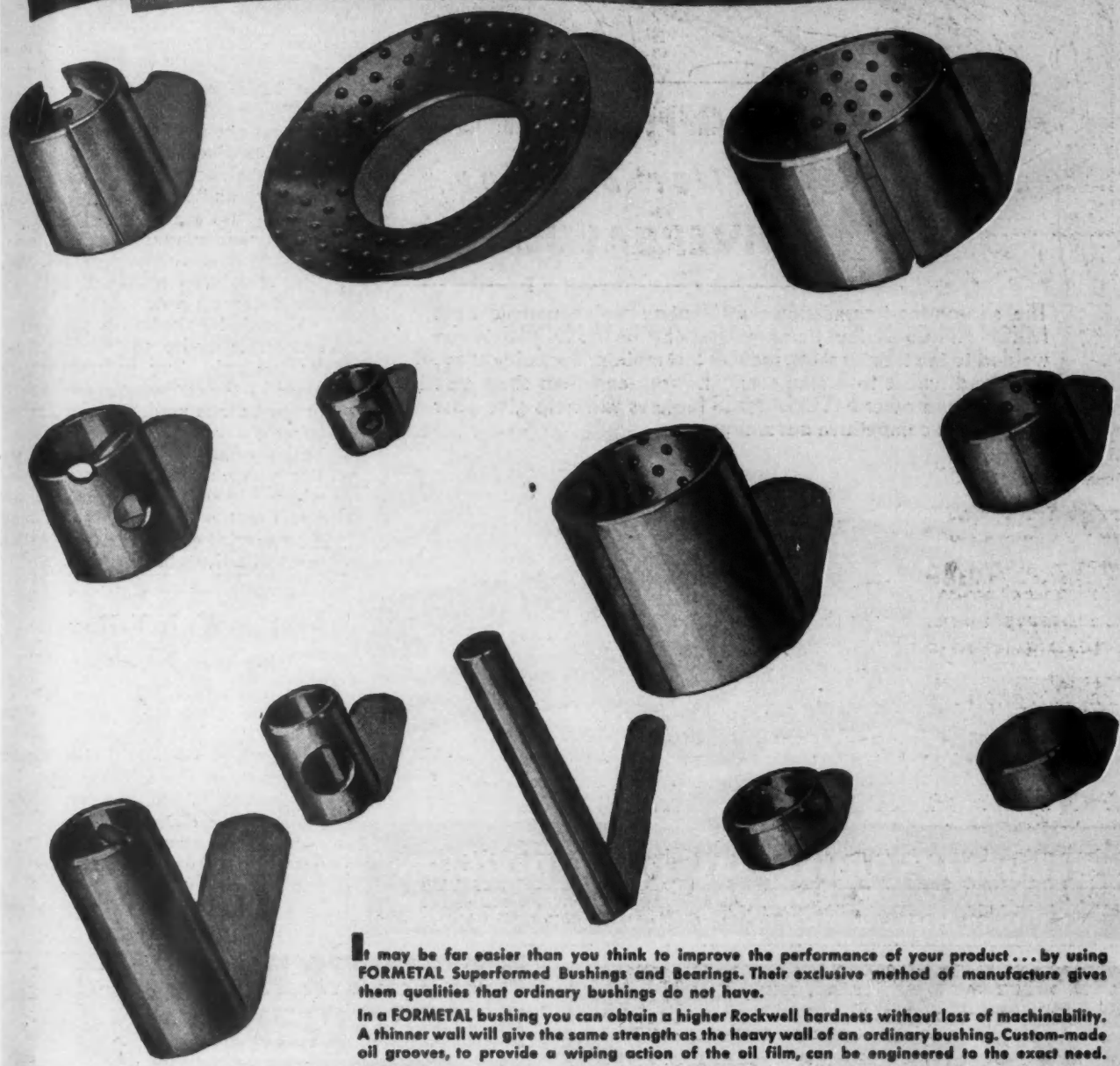
W. & S. turret lathes, B & S automatic screw machines, milling and grinding equipment; second operation lathes. Specializing in precision work and accurate machining of castings and forgings. Complete facilities list furnished.

KAL-CAR MACHINERY & TOOL CORPORATION
603 WEST 26TH STREET, NEW YORK 1, N. Y.

WHERE THERE'S A WILL . . . THERE'S A WAY

TO IMPROVE PERFORMANCE WITH

FORMETAL *Superformed* BUSHINGS AND BEARINGS



It may be far easier than you think to improve the performance of your product . . . by using FORMETAL Superformed Bushings and Bearings. Their exclusive method of manufacture gives them qualities that ordinary bushings do not have.

In a FORMETAL bushing you can obtain a higher Rockwell hardness without loss of machinability. A thinner wall will give the same strength as the heavy wall of an ordinary bushing. Custom-made oil grooves, to provide a wiping action of the oil film, can be engineered to the exact need.

Made of bronze, steel, or alloy of your specification, FORMETAL bushings or bearings *cost no more than ordinary types.* If you really want to improve performance write for free reference booklet of BUSHINGS, BEARINGS AND SPACER TUBES . . . engineers and buyers will find it tremendously informative.

To get your products really rolling . . . use FORMETAL!

NATIONAL FORMETAL CO., INC.

ESTABLISHED 1919

Manufacturers of "Superformed" Bushings and Bearings . . . and Spacer Tubes

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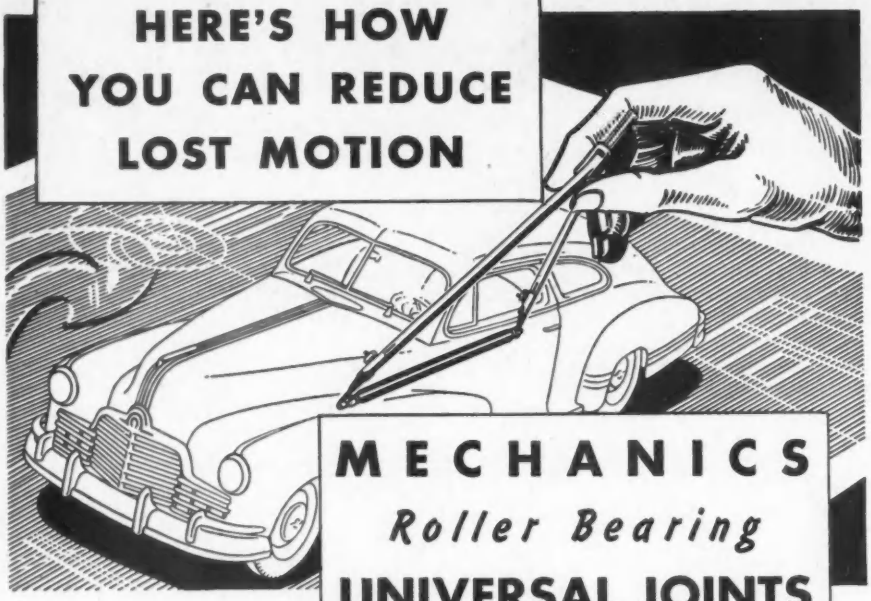
HERE'S HOW
YOU CAN REDUCE
LOST MOTION



MECHANICS
Roller Bearing
UNIVERSAL JOINTS

The slip-on-the-transmission-shaft feature which permits both MECHANICS Roller Bearing UNIVERSAL JOINTS to be welded to the tubular shaft, reduces lost motion, excessive play, whip and runout to a minimum. Let our engineers show you how this and other MECHANICS features will help give your new models competitive advantages.

MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner
2020 Harrison Avenue, Rockford, Ill. Detroit Office, 7-234 G. M. Bldg.

Torsion Tube Stabilizer

(*Continued from page* 44)

engaged, so that a driver cannot move his vehicle until the air-pressure system is functioning. The running gear is carried in large ball-bearings mounted in the end covers of the transmission casing. In the latest design the top gear thrust mechanism is self-contained at the front end, while the inner member of the top gear clutch is constrained about a flange formed integrally with the main shaft.

In addition to operating the gear change, compressed air is used for the four wheel brakes and for the automatic chassis lubricator. A feature of the brake mechanism is that, for the first three-quarters of the pedal travel, under light pressure, a maximum of 32 psi is obtained. On the last quarter of the travel, corresponding to emergency braking, and calling for greater physical effort, the full line pressure of 80 psi is made available. There is a separate cylinder for each wheel, those at the front being mounted on the top of the steering pivots.

Chassis lubrication is provided by an automatic device to 24 distinct points, leaving only four points to be lubricated by the ordinary grease gun. Compressed air is used for its operation, oil being ejected on each application of the brake pedal. Other features of the Regent include a full-floating rear-axle which incorporates an underslung worm with a four star bevel differential gear carried on taper roller-bearings in screwed adjustable housings.

Million Volt X-Ray

(*Continued from page* 38)

over a length of 38 ft, a lateral distance of 21 ft and a vertical travel of 18 ft.

Allowing for eight-min exposures and eight min to make a setup for six crankshafts, Auto Specialties can examine 24 crankshafts per hr. This is a maximum figure which is not always necessary to attain, particularly after a pilot lot has been studied and only spot checks need be made on subsequent lots.

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